DETAILED
SHELTER RESPONSE PROFILE

MALAWI

LOCAL BUILDING CULTURES FOR SUSTAINABLE AND RESILIENT HABITATS

1ST EDITION
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DEPARTMENT OF LANDS, HOUSING AND URBAN DEVELOPMENT

Shelter Cluster
ShelterCluster.org
Coordinating Humanitarian Shelter

Shelter Response Profiles (SRPs)

Background

The organisations backing this document (see back cover) have been working for several years on the elaboration and the dissemination of an identification method for local building cultures (LBC), especially in regard to their contribution to Disaster Risk Reduction (DRR). The aim is to facilitate the identification of the strengths and weaknesses of LBC and the opportunities they offer, in order to promote them – in an adapted version if necessary – in housing reconstruction, retrofitting or improvement projects.

To achieve this, it is important to consider that beneficiaries live in environments that are often shifting due to several factors such as climate change, urbanisation processes, globalisation and the evolution of social attitudes as local practices are challenged. Still, it is advised that the solutions proposed are found locally and to keep innovations limited to improve their chances of being adopted and thus to contribute to long term development and increased local resilience capacity.

Finally, SRPs are part of a wider set of tools and documents, and are potentially one of the activities of the Step 1 Understanding the context of the Protocol Informing choice for better shelter, developed by the Promoting Safer Building Working Group of the Global Shelter Cluster.

Content and some suggestions for use

This document introduces reference data on local building cultures and local sociocultural resilient strategies. These references are to be considered as a basis for the elaboration of project-specific strategies and also as a grid of analysis with a first set of conclusions. Context and details will differ from one place to another and stakeholders will benefit from the collected data in order to make comprehensive and accurate decisions.

SRPs are not exhaustive and they do not replace localized assessments in particular contexts. Thus, it is highly recommended to complete the information gathered in this profile through the organisation of field surveys which will also allow to exchange with local actors on the specificities of each local context.

To find out more

- Shelter Response Profiles
- Promoting Safer Building Working Group
- Protocol: Informing choice for better shelter
- Self-recovery project (GCRF Funds)

Objectives

SRPs have several complementary objectives:

- To help recognise the importance of understanding a context before proposing any action or project.
- To favour the development of shelter and human settlements responses (preparedness, early-recovery or later phases linking with development stages) more focused on localization, reduction of climate change impact, and promotion of self-recovery strategies.
- To help better take into account the existing construction sector, natural and human resources, local knowledge, solutions and good practices, and local cultural and social practices such as existing DRR knowledge, know-how and techniques at various scales (materials, building systems, house, compound, settlement organisation).
- To give a non exhaustive overview of a country or territory: demographic, cultural, social and economic data; hazards, environment and climate change impacts; impact of crises in the population; HLP issues; legal and institutional framework; construction sector, etc., and so to help orient practitioners in new contexts.
- To eventually become an advocacy tool for the shelter sector/cluster members, agencies, donors, or local authorities for more localized actions, more focused on promoting self-recovery and communities' resilience.

Target audience

Local, national, international, governmental, non-governmental and civil society actors involved in the prevention, preparedness and response to natural and human-made humanitarian crises in the habitat and human settlements sector.

History of the series of shelter response profiles

This publication is part of the series of documents: "Local Building Cultures for sustainable and resilient habitats". Several documents have been produced after a disaster (Fiji, Ecuador, Haiti) or before a disaster strikes as a preparedness tool (Bangladesh, Tonga, Malawi). Two profiles have been elaborated for situations of both protracted crises and disaster context (Ethiopia, Democratic Republic of Congo). For more information, see section 7.4 (page 81).

Cover images (from top to bottom):
House with closed and open covered spaces in Chitungulu, Nkhata Bay District (Northern Region). © Jon Twingi
Adobe house with thatched roof and a four sides veranda in Chipile, Mangochi District (Southern Region). © Jon Twingi
House built with fired brick walls and CGI sheets roof in Karonga (Northern Region). © Sonia Molina

Table of contents

Foreword

Introduction to the country

Malawi is a landlocked country in Southern Africa bordered by Tanzania to the northeast, Zambia to the northwest, and Mozambique on the east, south and west.

Its surface is 118,484km² (land: 94,276km²; water: 24,208km²) and its population was officially of 17,563,749 people in 2018 (National Statistical Office, 2019). Its poulation density was 186 persons/km² in 2018, what makes Malawi one of the ten most densely populated countries in Africa.

English and Chichewa are the official languages. Chewa (34.4%), Lomwe (18.9%), Yao (13.3%), Ngoni (10.4%), Tumbuka (9.2%) are the major ethnic groups.

The country may be divided into four zones regarding geographical and climatic characteristics (Halle & Burgess, 2006): the Highlands (elevations of 1,600 to 3,000m), the Plateaux (1,000 to 1,600m), the Rift Valley Escarpment and the Rift Valley Plains. Lake Malawi (third largest lake in Africa) and Lake Chilwa lie to the east.

It has a sub-tropical climate with two main seasons, cool-dry (May to October) and hot-wet (November to April). The climate varies with altitude: the lakeshore and southern Shire Valley are the hottest and most humid areas, while the higher agricultural plateau is more comfortable (Culture Grams, 2018).

Malawi is divided into 28 districts within 3 regions: Northern, Central and Southern regions. Its capital city is Lilongwe, in the centre, and the second major city is Blantyre, in the south.

The country has a fast growing rate of urbanization with 4.19% annual rate of change. Nonetheless, 82.6% of the population live in rural areas and agriculture is the main sector in terms of employment with over 80% of the working population employed on it (World Bank, 2019).

Malawi's HDI value for 2018 was 0.485(low human development) positioning it at 172 out of 189 countries and territories. Economic growth has been stagnant. Families have amongst the lowest annual income in the World, and about 50% of the population lives below the poverty line (World Bank et al., 2019).

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latitudes 9°- 18°S
longitudes 32°- 36°E

Physical map of Malawi.
© Ezylon

Hazards and vulnerability

According to the 2020 INFORM Risk Index (INFORM, 2019), Malawi is assessed as a medium country in overall risk (4.6). Over the period between 1979 and 2010, more than 21.7 million people were cumulatively affected by natural hazards, claiming more than 2500 fatalities (Government of Malawi 2015b).

In fact, Malawi faces a number of hazards, both natural and human-made, which include floods, drought, stormy rains, strong winds, hailstorms, landslides, earthquakes, pest infestations, diseases outbreaks, fire and accidents (Government of Malawi, 2015).

Floods and droughts are the most prevailing natural hazards in Malawi and the most affected zones are Central and Southern Regions (World Bank Group et al., 2019). In fact, there are floods or dry spells or both almost yearly (Government of Malawi, 2015).

The intensity and frequency of disasters have been increasing, in the face of climate change, population growth, urbanization and environmental degradation (Government of Malawi, 2015).

The increase in the frequency and intensity of these events has negatively affected people's lives, livelihoods and socio-economic infrastructure, pushing more and more people into poverty (CRS, 2020).

Rain-fed agriculture is very common and harvests are vulnerable to rainfall variability, droughts and floods, which creates food insecurity (World Bank, 2019).

There has also been an increase in the frequency and magnitude of disasters in urban areas, most of which are linked to climate change and variability and are manifestations of poor planning, limited drainage systems, inadequate and unregulated waste disposal and settlement in high risk areas (UN-Habitat, 2020b).

House built with burnt brick walls over a raised earth platform and with a thatched hipped roof. Kitchen in front of the main dwelling. Maganga, Nkhata Bay. © Jon Twingi

Adapted Local Building Cultures

In Chichewa, there is an expression which means to have a soft mind: *mutu wofewa* (Huang, 2017). Mtinga, an inhabitant of the village of Mudzi Owala (Ntcheu District, Central Region) said to Huang (2017): "the most important thing is to empty your brain. You are in Malawi now, so you must empty your brain. Maybe you already have ideas, but you must leave them. You will see many things here, and learn many things. It will be no good if you do not empty your brain".

In fact, when we speak about local building cultures and practices, having in mind the previous affirmation is crucial. Malawians have traditionally used adapted and innovative solutions to build their dwellings, with materials sourced from the local environment, evolving know-how and adaptation to local climates and ways of life. There are numerous good building practices in Malawi (see chapter 5) which need to be taken into account and valorised.

There is a need to continue using the existing local technologies and improve on them (UN-Habitat, 2010). In fact, the Goverment of Malawi (2015) proposed in the floods post-disaster needs assessment report, as a medium term activity, to "promote the use of affordable materials and appropriate technologies that will minimize the impact of housing on the environment". However, sometimes it happens that local solutions are not well perceived. For example after the floods in 2015, CRS needed to convince government personnel, politicians and other organizations that houses constructed from local materials could provide a sufficiently durable solution, mainly by building model houses that demonstrated this potential (CRS, 2018).

UN-Habitat (2010) has insisted that any temptation to raise standards or insist on all housing complying with draft building regulations should be avoided, as it would be both unrealistic and harmful. There is a need to understand the values of local building practices and to build projects upon their strengths, and trying to overcome their weaknesses.

Use of this Shelter Response Profile

This Shelter response profile aims at providing a basic understanding of the context and the relevant key issues for shelter-related operations, especially to support humanitarian projects through making the best use of existing good practices offered by Local Building Cultures (LBCs) and Building Back Better/Safer activities promoted by emergency and development responders.

In response to the local particularities of climate, hazards and cultural needs, different building cultures have been developed, offering a variety of context-specific solutions, including with regard to local coping mechanisms. The information on LBCs presented in this document is organised per division where solutions differ, and issues which apply throughout the country have been grouped in a single chapter.

The focus is on the local building practices and materials that support Building Back Better/Safer and leverage people's capacities for self-recovery. At the same time dangerous or inefficient practices are highlighted and recommendations given for sustainable and resilient shelter practices.

In order to concretely illustrate the concept of drawing inspiration from LBCs in a successful housing project, examples of housing projects and architectural designs are presented in chapter 6. This chapter shows houses inspired from traditional models that have been studied whithin reverse engineering process to adapt to contemporary constraints and possibilities and suit the evolution of lifestyles.

The information in this booklet is meant to help agencies and their experts to make informed choices for their shelter response projects. Though, to make sure that local specificities are well taken into account, this information will need to be precised or completed through the organisation of dedicated field missions and more contextualised analysis (see recommendations in p. 82-83).

House built over a raised earth platform with adobe walls, thatched hip roof and a four sides veranda. Mpale, Mangochi. © Jon Twingi

Rammed earth house under construction in Nisanje, Lilongwe. © Jon Twingi

1. Introduction

1.1. Why local building cultures* are important today

All over the world, societies have managed to produce, adapt and develop their habitat according to their needs, interests, aspirations, preferences and abilities, making the best use of locally available materials. Strategies developed take advantage of natural resources to protect against the destructive forces of nature and have always generated rich and varied knowledge at local levels.

(Re)discovering the intelligence of local architectures and analysing their associated practices is often very useful in the process of designing disaster resistant architectures in accordance with build back safer principles, but also to adapt to contemporary lifestyles and their evolution, to respect the local environment and culture and to conform to the technical and economic capacities of local populations.

Relying on, or at least getting inspiration from local knowledge, know-how, construction processes and traditional means of organisation has proved very effective, as it favours:

- The implementation of solutions well adapted to local ways of life and the suggestion of viable improvements;
- The possibility to shelter many people quickly and cost-effectively while taking into account seasonality effects as well as factors like religious festivals and livelihood activities;
- Large-scale reproducibility of the improvements designed in continuity with local building cultures and an easy access, both financially and technically, to the promoted solutions for non-beneficiaries.
- A positive impact on local economies as local skills and materials are fully promoted, while also taking into account environmental concerns linked to the construction industry;
- Greater short and long-term ownership by the beneficiaries through their participation in decision-making and project implementation processes;
- Empowerment of local populations through the recognition of the value of their existing capacities for building and the improvement of their resilience.

To develop a disaster resistant architecture adapted to current local ways of life, it is important to involve the beneficiaries and the local professionals and decision makers from the very beginning of the recovery phase. Also, rebuilding is often necessary and can be very demonstrative and convincing, and therefore promoting pertinent repairs when possible may help reaching this goal. This way, the connexion between relief, recovery and development is enabled and so, the long term benefit of a shelter project is ensured. In addition to the provision of shelters, higher levels of resilience within the project area are reached.

* The concept of Local Building Cultures and other important terms related to the topics addressed in this document are defined in Section 7.2. «Key concepts».

Construction of a foundation. CC- Gregory S.

1.2. Malawi SRP

Self-recovery project in Malawi

The Malawi Shelter Response Profile has been developped in the framework of the Self-recovery research project (https://self-recovery.org/), thanks to a grant from the Global Challenges Research Fund (GCRF) Global Research Translations Award.

The Self-recovery Project's activities in Malawi have been focused on testing the Protocol "Informing choice for better shelter".

After forming the Technical Working Group, the production of this Shelter Response Profile has made part of the first step of the Protocol "Understanding the context".

This document can become a basis for the implementation of other steps of the Protocol such as the definition of priorities regarding IEC objectives or the identification of stakeholders and audiences.

This profile can also become a baseline document for shelter and housing related operations.

Information, data collection and production

This Profile was elaborated after a dedicated literature review of more than one hundred documents (see chapter 7) and thanks to information collected during and after a number of experiences by the authors and their partners in Malawi, as well as through exchanges with Malawian or Malawi-based Government of Malawi representatives, technicians, academics or experts. The document has been reviewed by several international and Malawian experts and shelter and housing actors in Malawi.

The strengths of local construction and practices, including a variety of hazard-resistant practices, knowledge and experience developed by local communities, have been identified, analysed and many of them validated over the years, and are here summarized and disseminated.

This profile was presented during the Malawi National Shelter Learning Event in September 28th 2021 to a wide representation of shelter and housing actors in the country. After this, the last contributions were received and the first version of the profile was published.

The document is intended to be a living one, all new contributions are much appreciated.

Decorated house with regular form and openings, thatched lightweight roof and four sides veranda (Malaza, Salima). © Jon Twingi

In some areas, there is a need to help one another build their home. Construction of a rammed earth house in Nisanje, Lilongwe. © Jon Twingi

2.1. GENERAL DESCRIPTION

Sources: CRS & Cadecom (2019), Culture Grams (2018), Famine Early Warning Systems Network (2013), Government of Malawi (2015, 2016b), Halle & Burgess (2006), metmalawi.com, Namaona (s.d.), Nations Encyclopedia, Protected Planet, Wikimedia, World Bank group et al. (2019)

A. LOCATION

Malawi is a landlocked country in Southern Africa bordered by Tanzania to the northeast, Zambia to the northwest, and Mozambique on the east, south and west.

©Wikimedia
latitudes 9°- 18°S
longitudes 32°- 36°E

B. PHYSICAL AND TOPOGRAPHICAL DATA

Area: 118,484km2 (45,747 sq mi). Land: 94,276km²; water: 24,208km² (including Lake Malawi and Lake Chilwa).

Elevation: lowest point (on land): Shire River at the Mozambique border (37 meters). Highest point: Mount Mulanje or Sapitwa (3,002 meters).

Relief: Malawi may be divided into four zones (Halle & Burgess, 2006):
The Highlands: extensive highland tracts, the most prominent of which are the Mulanje, Zomba and Dedza mountains, attaining elevations of 1,600 – 3,000m.
The Plateaux: elevations of 1,000 to 1,600m, covering most of the Central and Northern Regions with broad valleys drained by seasonal *dambo* streams.
The Rift Valley Escarpment: the East African Rift descends from the plateaux in a series of stepped faults with abrupt slopes, known as the Rift Valley Escarpment.
The Rift Valley Plains: plains largely formed by the deposition of materials eroded from the Rift Valley Escarpment, characterised by gentle slopes, and extending along parts of the Lake Malawi shore and the Upper Shire Valley. Elevations are less than 600m and decline to 37m in the Lower Shire Valley.

Landscapes: diverse flora and fauna made up of various woodlands, tropical rain forests, open savannah high altitude grasslands and scrub (Namaona, s.d.).

Drainage systems: two drainage systems: Lake Malawi and Lake Chilwa. The first one dominates the country and counts rivers such as the Songwe, South Rukuru and North Rukuru. Lake Malawi is tributary of River Shire, which flows to the south into Mozambique and it is the third-largest lake in Africa. Lake Chilwa is a small drainage system in the southeast of the country (World Bank Group et al., 2019).

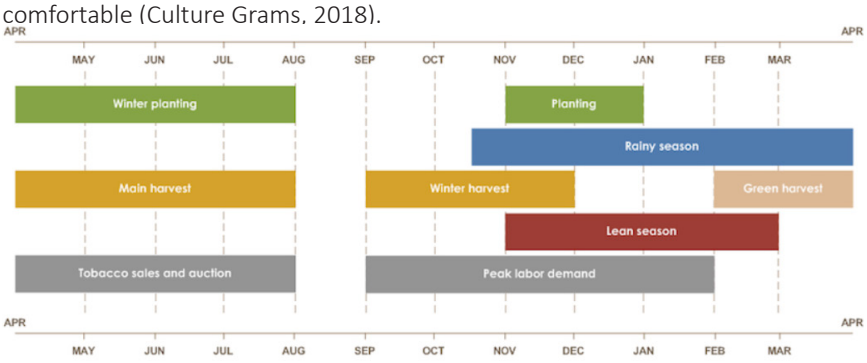
Physical map of Malawi. © Ezylon

C. CLIMATE

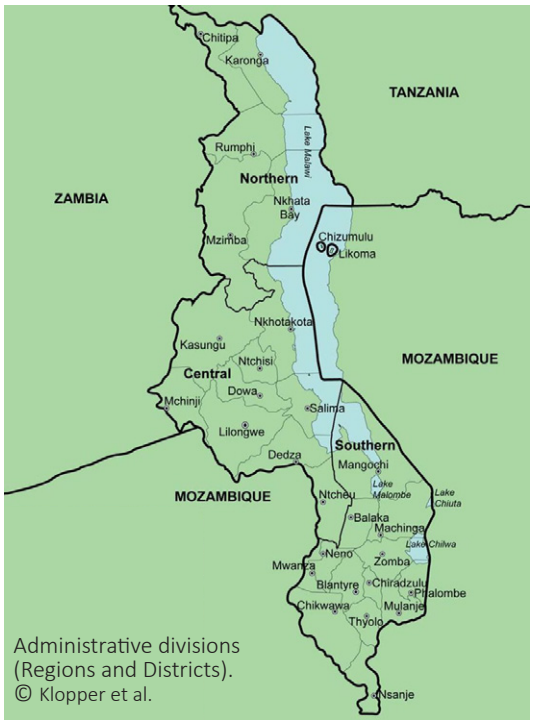
Malawi has a sub-tropical climate, which is relatively dry and strongly seasonal.

Rainfall seasons: There are two main seasons, cool-dry (May to October) and hot-wet (November to April). The rainy season brings 95% of Malawi's annual rainfall (metmalawi.com), which varies from 725mm to 2,500mm.

Temperature: Temperatures during the coolest period (May–August) vary between 17 to 27°C, with temperatures falling between 4 and 10 degrees Celsius (metmalawi.com). The hottest period (August–October) produces temperatures of 29 to 38°C (Culture Grams, 2018). The lakeshore and southern Shire Valley are the hottest and most humid areas, while the higher agricultural plateau is more comfortable (Culture Grams, 2018).



Seasonal calendar in Malawi. © Famine Early Warning Systems Network (2013)



Administrative divisions (Regions and Districts). © Klopper et al.

D. Protected areas and world heritage sites

Protected areas: the World Database of Protected Areas cites 133 Protected areas in Malawi. 23% (27,190km²) of the terrestrial area is protected. They are biodiversity hotspots, as well as a source of livelihoods and natural resources.

World Heritage Sites: Malawi has two sites in the UNESCO World Heritage List: the Cultural site of Chongoni Rock-Art Area (2006) and the Natural site of Lake Malawi National Park (1984). There are also 6 sites in the World Heritage Tentative List.

E. Administrative data

The capital city is Lilongwe.

Malawi is divided into 28 districts within 3 regions. There is one tier of local government, currently consisting of 35 Councils: 28 District Councils, 4 City Councils, 2 Municipal Councils and 1 Town Council. The three administrative regions (central, northern and southern) that divide up Malawi's national territory are not sub-national governments, do not have elected councils or administrative heads, and largely serve as geographical units for the purposes of deconcentrated line ministries (Government of Malawi, 2016b).

TO FIND OUT MORE

On sections 2.1. and 2.2.

- National Statistical Office of Malawi
- CIA world factbook (Malawi)
- World database of protected areas (Malawi)
- Unesco (Malawi)
- Culture Grams World Edition: Republic of Malawi (2018)
- UNDP (Malawi)

2.2. Demographic, cultural, social and economic factors

Sources: CIA World Factbook, Culture Grams (2018), FAO, Huang (2017), Malawi Human Rights Commission (2014), Malawi, Ministry of Lands, Housing and Urban Development (2015), Malawi, Ministry of Natural Resources, Energy and Environment, (2010), Manda (2013), Mwathunga (2014), National Statistical Office (2019), Ramparsad (2015), UNDP, UN-Habitat (s.d.; 2020b),

The information found hereafter is not exhaustive and may evolve.

A. Demographic data

Total population: 17,563,749 (official, Census 2018). 21,196,629 (estimated, CIA World Factbook).

Population density: 186 persons/km² (official). Southern Region: 244 persons/km²; Central region: 211 persons/km²; Northern region: 84 persons/km².
Human Development Index (HDI): 0.485 (low)

Population growth rate: 3.3%

Median age: 17 years

Age structure: 0-14 years: 45.87%; 15-24 years: 20.51%; 25-54 years: 27.96%; 55-64 years: 2.98%; 65 years and over: 2.68%

Sex ratio: 94.2 males per 100 females

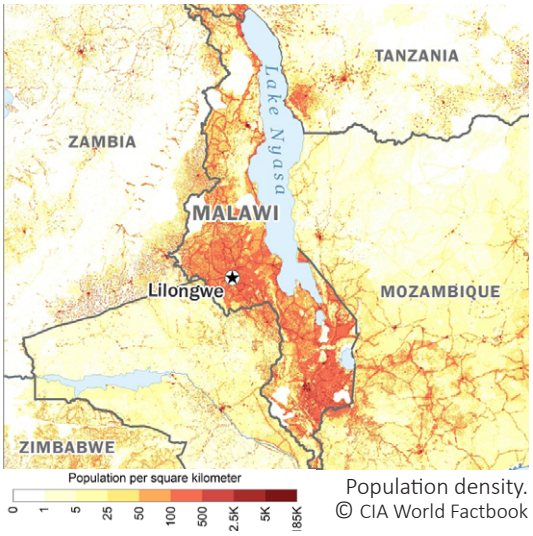
Net migration rate: 0.00 migrant(s)/1,000 population

Urban population: 17.4%

Rural population: 82.6%

Rate of urbanization: 4.19% annual rate of change

Major urban areas: Lilongwe (capital city): 1.122 million; Blantyre: 932,000. Mzuzu and Zomba are other major cities.



Population density. © CIA World Factbook

B. Languages

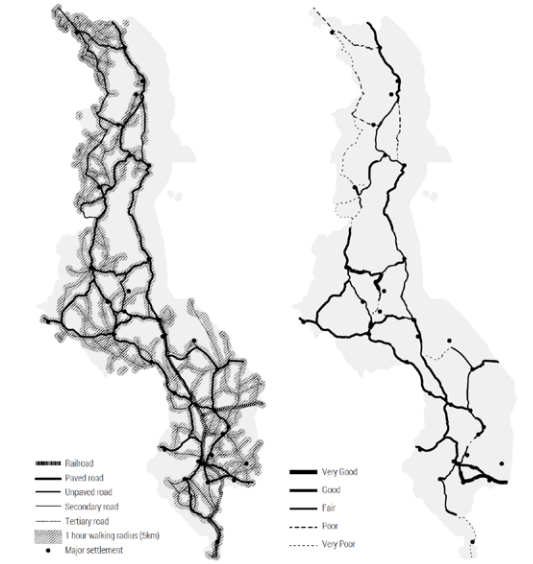
English (official language): it is used in government and business. Many Malawians are fluent; others speak or understand it to lesser degrees.

Chichewa (official language): it is the main national language, and it is taught in schools along with English. It dominates in central and southern regions.

Other ethnic groups speak their own Bantu-related languages but usually know some Chichewa. **Chilombwe** and **Chiyao** are spoken in the southeast, while **Chitumbuka** is spoken mostly in the north.

C. Ethnic groups

Chewa: 34.4%; Lomwe: 18.9%; Yao: 13.3%; Ngoni: 10.4%; Tumbuka: 9.2%; Sena: 3.8%; Mang'anja: 3.2%; Nyanja: 1.9%; Tonga: 1.8%; Nkhonde: 1.0%; Other: 2.2% (National Statistical Office, 2019).



Condition of major roads. © Huang (2017)

D. Religion

Roman Catholic: 17.2%; Presbyterian (CCAP): 14.2%; Sunni muslim: 13.8%; Seventh Day Adventist/Baptist/Apostolic: 9.4%; Other Christian: 26.6%; Other non-Christian: 5.6%; No religion: 2.1%. Not many Malawians practice traditional indigenous beliefs exclusively.

Christians often mix their beliefs with traditional beliefs manifested through rituals, festivals, and dances (Culture Grams, 2018).

E. Education

Literacy rate (age 5 and more): 68.6% (men: 71.6%; women: 65.9%)

Government expenditure on education: 4% of GDP

Expected years of schooling: 11.0

Out of school children in primary shool: 24.5% (over one million) of the children with ages from 6 to 13 years old.

Out of school children secondary shool: 82.2% (1.4 million) of the children with ages from 14 to 17 years old.

General information (Culture Grams, 2018): teachers are in short supply, especially in rural areas. The language of instruction is English, which few students speak when they enter school. Chichewa is taught as a subject.

Education infrastructures: facilities are in short supply, particularly in rural areas, where students may have to walk long distances to school each day, and some classes are held outdoors under trees because of classroom shortages (Culture Grams, 2018). School structures have an average of 500 pupils, are commonly overcrowded, and are composed by a series of 2/3 classrooms blocks with concrete floor, fired bricks, cement blocks or SSBs masonry, wooden roof structure and corrugated metal sheets coating (UN-Habitat, s.d.).

F. Health

Life expectancy: 63.2 years

Fertility rate: 5.31 children born/woman

Infant mortality rate: 39.5 deaths/1,000 live births

Births rate: 40.1 births/1,000 population

Death rate: 7.2 deaths/1,000 population

Health expenditures: 9.6% of GDP (2017)

Physicians density: 0.02 physicians/1,000 population (2016)

Hospital bed density: 1.3 beds/1,000 population (2011)

HIV/AIDS (adult prevalence rate): 9.2% (2018), 1 million people

Major infectious diseases:
- food or waterborne diseases: bacterial and protozoal diarrhea,
- hepatitis A, and typhoid fever;
- vectorborne diseases: malaria and dengue fever;
- water contact diseases: schistosomiasis;
- animal contact diseases: rabies, trachoma.

General information (Culture Grams, 2018): Malawi has one of the world's highest rates of infection of HIV/AIDS. Many families have lost both parents to HIV/AIDS, in which case households are often headed by older children or the elderly.

Tuberculosis, malaria, bilharzia, diarrhea, cholera, malnutrition, and respiratory infections are widespread. Other priorities are sanitation, immunizations, family planning, and maternal and child health care.

Health infrastructures: Accessibility and lack of electricity in remote areas are the major problems in terms of health services in Malawi, 60% of which are under the Ministry of Health, 37% under the Christian Health Association in Malawi (CHAM), while the remaining 3% is owned by private institutions (UN-Habitat, s.d.). Government efforts have increased access to free rural health centers or fee-based mission hospitals, and at the same time traditional healers (*Sing'anga*) are common and widely used (Culture Grams, 2018).

G. Economy

Currency unit: Malawian kwacha (MWK). 1 US$ = 752 MWK (october 2020)

GDP (purchasing power parity): $22.42 billion (2017 est.)

GDP - real growth rate: 4% (2017 est.)

GDP - per capita (PPP): $1,200 (2017 est.)

GDP - composition, by sector of origin (2017 est.): agriculture: 28.6%; industry: 15.4%; services: 56%

Labour force: 7 million people (2013)

Labor force by occupation (2013 est.): agriculture: 76.9%; industry: 4.1%; services: 19%

Unenployment rate: 20.4% (2013)

Population below poverty line: 50.7% (2010 est.)

Inflation rate (consumer prices): 12.2% (2017 est.)

Public debt: 59.2% of GDP (2017 est.)

Gini index (0 represents perfect equality, while 100 implies perfect inequality): 44.70 (2016)

General information: In 2014, 41% of Malawians earned less than MWK10 000 (US$18) a month, only 10% of adults earned a salary, and 23% earned their income through their own business and 43% through farming (Ramparsad, 2015).

Rain-fed agriculture is very common and harvests are vulnerable to rainfall variability, droughts, floods and fall armyworm, what creates food insecurity to the population (CIA World Factbook; World Bank, 2019). Corn is the staple crop in the Country.

Also, agriculture accounts for 80% of export revenues. The performance of the tobacco sector is key to short-term growth as tobacco accounts for more than half of exports (CIA World Factbook). Tea, sugar and coffee are the other most important export products (World Bank, 2019).

H. Transportation

Walking: walking is the most common travel mode in both rural and urban areas (UN-Habitat, 2010).

Vehicles: Bicycle use for private and public transport is icreasing. Motor vehicles are complimented by handcarts, animal carts and wheelbarrows in the transportation of goods and services, especially over short distances (UN-Habitat, 2010).

Roadways: 15,452 km (2015) (paved: 4,074 km; unpaved: 11,378 km). The official road network comprises main, secondary, tertiary, district and urban roads (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).

Where roads are available, they tend to be narrow, and lack drains, cycle and walkways (Manda, 2013). Major roads are constructed and maintained by Roads Authority and maintenance is also a challenge. Local roads are under local councils (Manda, 2013).

Lake ports: Chipoka, Monkey Bay, Nkhata Bay, Nkhotakota, Chilumba.

Airports: 32 (7 with paved runways; 25 with unpaved runways)

I. Some social organisation principles

Family: The family is considered a person's greatest asset. Parents fondly refer to children as "Firstborn," "Secondborn," and so on (Culture Grams, 2018).

Community: Society is group oriented; individuals sacrifice their interests for the good of the family or community (Culture Grams, 2018).

Matrilineal or patrilineal families: in Malawi, there are different ethnic groups presenting different social organisations. According to Culture Grams (2018), depending on the ethnic group, families may be either matrilineal (in which the wife's side of the family is dominant) or patrilineal (in which the husband's side is dominant). In matrilineal families, couples live with the wife's family after marriage. In patrilineal families, which are more common, couples live with the husband's family.

Traditional authority: the Local Government Act of 1998, recognised traditional authorities as ex-offio members of the local government area, by implication, including town or city assembly (Mwathunga, 2014).
Most villages have a traditional chief, (also known as blood chief) and a traditional doctor, who often work in tandem as authority figures. Some are good and well-respected chiefs (Huang, 2017).
A head chief oversees a group of approximately ten villages. Some areas have matriarchal societies, and thus sometimes women can hold positions of high authority (Huang, 2017).
In many councils, the "blood chiefs" are still in control of the urban areas due to the presence of villages inside them that have not been fully compensated and relocated as required by the Land Acquisition Act. The tendency had made the recognition of local people to spearhead various developments problematic (Malawi, Ministry of Lands, Housing and Urban Development, 2015).

J. Gender issues

Usual gender roles (Culture Grams, 2018): families are often led by men, who support the family economically and generally make final decisions related to their wives and children. Women are responsible for raising the children, caring for the home, and cooking. Girls care for younger siblings, gather firewood, clean, and fetch water, while boys generally assist with farming, tending livestock, and other chores .

Latest evolutions (Culture Grams, 2018): A growing number of women, particularly in urban areas, work outside the home or attend higher education. While in the past families generally valued educating their sons over their daughters, today boys and girls attend school in nearly equal numbers. Women occupy important positions in business and government.

Discrimination (Culture Grams, 2018): despite these gains, women still face significant discrimination in society. While Malawian law grants women equal rights, traditional customs often favor men. Rates of domestic violence are high. Female circumcision, also called female genital mutilation, still happens among a few small ethnic groups.

Poligamy (Culture Grams, 2018): although Malawian law prohibits polygamy, about 14% of women are in polygamous relationships. Such marriages cannot be registered with the government, leaving women without the legal rights associated with marriage. In these families, the man builds a separate hut for each wife and her children.

K. Persons with disabilities and albinism

Persons with disabilities: About 10.4% of the population aged 5 years and older in Malawi had at least one type of disability (difficulties or problems in one or more of the following areas: seeing, hearing, walking/climbing, speaking, intellectual, self-care and other difficulties). 10% of the males and 11% of the females had disabilities (National Statistical Office, 2019).

In 2018, 1,556,670 persons had at least one type difficulty: 49% seeing, 24% hearing, 27% walking/climbing, 9% speaking, 16% had intellectual difficulties, 8.5% had problems with self-care (National Statistical Office, 2019).

Albinism: 0.8% of the Malawian population (134,636) were persons with albinism (National Statistical Office, 2019).

L. Communication habits

Greetings (Culture Grams, 2018): when meeting, Malawians shake right hands while placing the left hand under the right forearm, showing sincerity and trust (at least before COVID-19). People also dip their knees slightly when exchanging greetings. If greeting elders or people of authority, some groups kneel down and clap their hands quietly two or three times. Usually, women dip their knees even if the person has lower status.
People greet with an exchange of "Hello, sir" (*Moni bambo* in Chichewa) or "Hello, madam" (*Moni mayi*), followed by "How are you?" (*Muli bwanji*? in Chichewa). The common response is "I am fine" (*Ndili bwino*). It is also polite to ask about the family.

Courtesy (Culture Grams, 2018): first names are rarely used to address older people, who are formally addressed as «Madam» or «Sir,» followed by the surname. Informally, surnames alone are used. Persons in authority are addressed as *Bwana* (Boss). In most of Malawi's languages, placing the prefix a- before a name or title shows respect: *bambo* is the word for «man,» but usually one would address a man as *abambo.* Young adults and teens use first names but may also address each other as *chimwali* (sister) or *chimwene* (brother). People use *iwe* (you) with people of their same age or younger. An older person is addressed as *inu* (you).
Malawians generally give and receive items with both hands.
Eye contact is important but direct gazes are limited, especially toward elders or persons of authority.
Leaving a small amount of food on the plate when finished assures that a person has had enough to eat. Tea serves as an important aspect of hospitality (Huang, 2017).

M. Access to information

Telephones - mobile cellular: 36% of population (2018). Coverage is best in urban areas, and is growing in rural areas. 3 mobile-cellular operators govern the market (CIA World Factbook).

Telephones - fixed lines: less than 1% of the population (2018)

Internet users: 13.78% of population (2018)

Radio access: radio is the main source for information. Privately owned Zodiak radio has the widest national broadcasting reach, followed by state-run radio; numerous private and community radio stations broadcast in cities and towns (CIA World Factbook).

TV access: The largest TV network is government-owned; at least 4 private TV networks broadcast in urban areas; relays of multiple international broadcasters are available (CIA World Factbook).

Newspapers and postal system: Democracy has encouraged the growth of newspapers and allowed for a more reliable and private postal system (Culture Grams, 2018).

2.3. Hazards, environment and climate change impacts

Sources: Bureau TNM (2016), CRS (2019), EM-DAT- The International Disaster Database, Government of Malawi (2015; 2015b; 2019), Hajat et al. (s.d.), Halle & Burgess (2006), IHME (2017), INFORM (2019), Kloukinas et al. (2019a), Macharia (2017), Malawi, Ministry of Natural Resources, Energy and Environment (2010), Pourazar (2017), Pullanikkatil et al. (2016), Uark (2017), UN-Habitat (s.d.; 2020a), World Bank group (2018), World Bank group et al. (2019)

A. Vulnerability and exposure

According to the 2020 INFORM Risk Index (INFORM, 2019), Malawi is assessed as a medium country in overall risk (4.6). Drought has the highest risk indicator of hazards, followed by flood and earthquake. Over the period between 1979 and 2010, more than 21.7 million people were cumulatively affected by natural disasters, claiming more than 2500 fatalities (Government of Malawi 2015b).

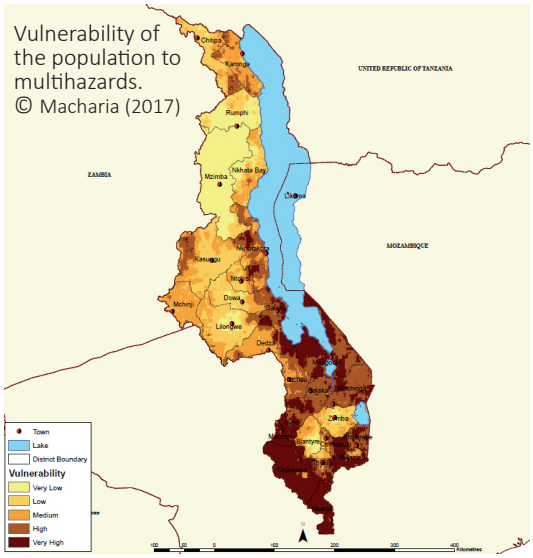
Vulnerability: Malawi's vulnerability is exacerbated by (Government of Malawi, 2019): (i) high level of dependence on rainfed agriculture; (ii) cultivation of less resilient crop varieties; (iii) excessive cultivation of and settlement in marginal lands; and (iv) environmental degradation due to rapid population growth.

The whole country is vulnerable, but very high vulnerability is observed in the Southern region and some parts of the Central region (Macharia, 2017). The most vulnerable districts are Chikwawa, Nsanje and Mangochi, while high and very high vulnerability is also observed in parts of Neno, Mulanje, Chiradzulu, Machinga, Dedza, Thyolo, Phalombe, Balaka, Salima, Karonga and Chitipa.

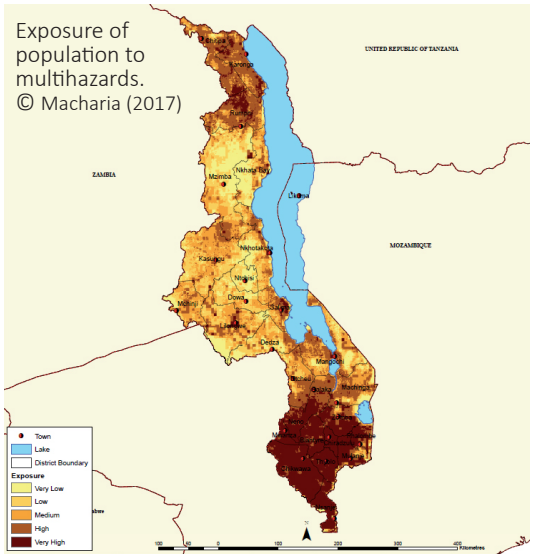
Exposure: Southern and Northern regions as well as hotspots along the lakeshores and in some other parts of the Central region have high to very high exposure (Macharia, 2017). This is calculated regarding precipitation variables: trend and coefficient of variation, temperature trend, flood frequency, drought physical exposure and forest fires.

Social and spatial exposure to risk: there are spatial differences in exposure to risk, as for example informal settlements are often sited on hazard-prone areas (Government of Malawi, 2019). In a study in Karonga (Uark, 2017) it is explained that although all the city is exposed to many risks, they are most prevalent in three specific areas including the informal settlements. In these settlements, exposure to risk is higher due to several factors: they have the largest proportion of the population; they are placed in the flood plain along the river, the lakeshore, and in flood-control drainage channels; there is less secure tenure; there is lack of or blocked drainage, there is denial of state infrastructure and service provision because they are informal (Uark, 2017). This also happens in other cities like Lilongwe, where the informal settlements along the Mchesi River have reported frequent flooding, with significant impacts on the inhabitants: crops grown along the river being washed away, houses being destroyed and vegetation cover being severely damaged (Government of Malawi, 2019).

A lack of regulations on waste-management and environmental degradation also have an impact on site safety (Government of Malawi, 2019).



Vulnerability of the population to multihazards.
© Macharia (2017)



Exposure of population to multihazards.
© Macharia (2017)

B. Natural hazards

Malawi is highly susceptible to climate-related shocks, including floods, droughts, hailstorms, strong winds and earthquakes (Government of Malawi, 2019). These shocks are linked to a number of factors, including: (i) the influence of the El Niño and La Niña phenomena; (ii) the hydrological network, with its dependence on rainfall and its susceptibility to damage; and (iii) Malawi's location along the great African Rift Valley (Government of Malawi, 2019).

Floods: 100,000 people and 200 education and healthcare facilities are affected by flooding on average each year (World Bank Group et al., 2019). River flooding is the main risk, as several rivers present a flood potential along the country, especially during the rainy season from November to April, from which the Shire River has the greatest potential (World Bank Group et al., 2019). Surface flooding, including urban flooding, can also be a problem (World Bank Group et al., 2019).

- ☑ Floods
- ☑ Droughts
- ☑ Earthquakes
- ☑ Strong winds/ storms
- ☑ Landslides
- ☑ Soil erosion
- ☑ Subsidence & heave
- ☑ Liquefaction of soils
- ☑ Fire
- ☑ Pest hazards

Droughts: around 1.5 million people are affected by droughts every year, mainly in the Central and Southern regions of Malawi; and one time in 10 years, more than 3.5 million people are affected by droughts (World Bank Group et al., 2019).

Droughts have contributed to food crises of great importance, for instance in 2016/2017, when more than 6 million people were in need of food assistance (World Bank Group et al., 2019). Drying of crops, death of livestock and malnutrition/hunger are the main consequences of droughts (UN-Habitat, 2020a).

Earthquakes: being on the East African Rift Valley System, the entire country is prone to earthquakes (Bureau TNM, 2016), with the main seismic hazard occurring all around Lake Malawi, where a strong earthquake would be expected to occur once in a person's lifetime (World Bank Group et al., 2019). Strong earthquakes in Malawi are infrequent, but an estimated 200,000 people could experience ground shaking or bigger effects at least once every 50 years (World Bank Group et al., 2019).

Two earthquakes have caused major damage recently: the 1989 Salima and the 2009 Karonga earthquakes, which affected tens of thousands of people severely (their properties damaged or lost and them being displaced or made homeless) and agriculture was also significantly impacted (Kloukinas et al., 2019a).

Strong winds and storms: Strong winds (sustained winds of 24.5 m/s or greater speed), storms and occasionnally hailstorms heavily affect the entire country of Malawi, with severe consequences on constructions (Bureau TNM, 2016). They occur annually, especially in the rainy season (UN-Habitat, 2020a).

Landslides: landslide is very localised and represents an overall low risk in Malawi, with high to very high hazard occuring at the Mulanje Massif in the southeast of the country, at the Malosa Complex north of Zomba; to the east of Dedza along Lake Malawi and in the very north highlands (World Bank Group et al., 2019).

Soil erosion: soil erosion due to wind or water activity leaves the land vulnerable and unprotected, resulting in loss of fertility and strength (Bureau TNM, 2016).

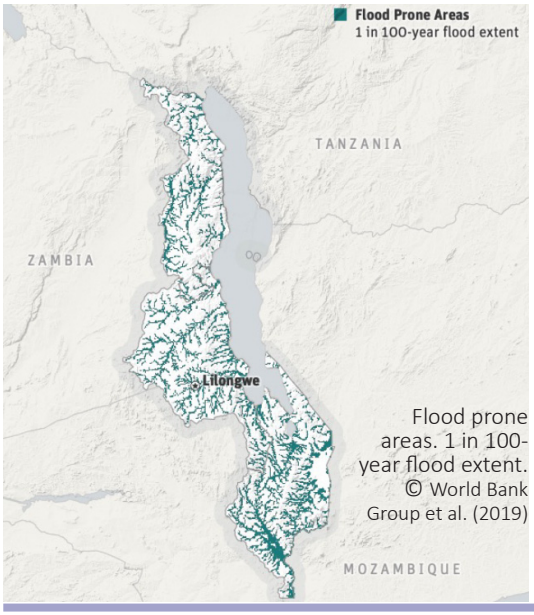
Subsidence and heave (black cotton soils): soil type, soil moisture and organic content are primarily the cause of subsidence and heave especially where there are high shrinkage clays (Government of Malawi, 2010) or black cotton soils. In Malawi there are vertisols (high content of expansive clay minerals, like montmorillonite) in Nsanje district in the South of the country, as well as in a small zone in Phalombe district to the South-East. If a building is laid in this kind of soil, the soil will become saturated with water during the rainy season and during the seasonal drying foundations will move due to the drying of the soil, and this can result in cracks or even in the collapse of the building (Bureau TNM, 2016).

Liquefaction of soils: it happens when loose saturated with water sands or silts are shaken and the material consolidates, reducing the porosity and increasing the water pressure within pores. When this occurs, the ground can settle unevenly, and buildings supported by this soil suffer great damage (Bureau TNM, 2016).

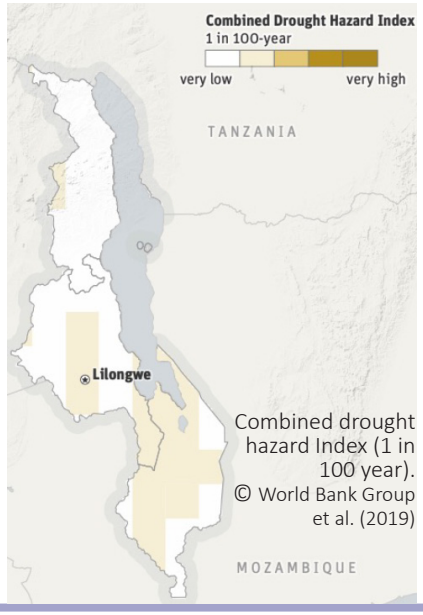
Fire: fire disasters can affect small areas or expand to larger areas if not controlled and extinguished (Bureau TNM, 2016) and can of course affect houses, infrastructures and agriculture.

Pest hazards: they include insects, weeds/pathogens and vertebrates and cause important annual losses in agriculture, forestry, infrastructure, housing and human health (Halle & Burgess, 2006):

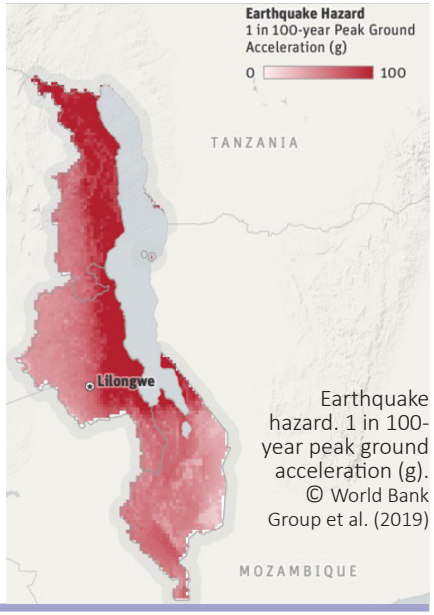
- Army worms are a regularly experienced hazard with potentially devastating consequences (Hajat et al., s.d.). The Army Worm Early Warning System is one of the most active and functional systems in place. When levels of infestation are increasing, warnings are communicated by extension officers closest to the infestation and District officials respond by applying pesticides to prevent or contain any outbreak in usually less than 48hrs.
- Termites affect the construction sector, as sometimes they can attack the wooden parts of buildings passing through the foundations, entering in the walls, and reaching the roofs and all the structural parts of the house made of wooden material (Bureau TNM, 2016).
- Other pests include the water hyacinth (*Eichornia crassipes*), locusts and Quelea birds (Halle & Burgess, 2006).



Flood prone areas. 1 in 100-year flood extent. © World Bank Group et al. (2019)



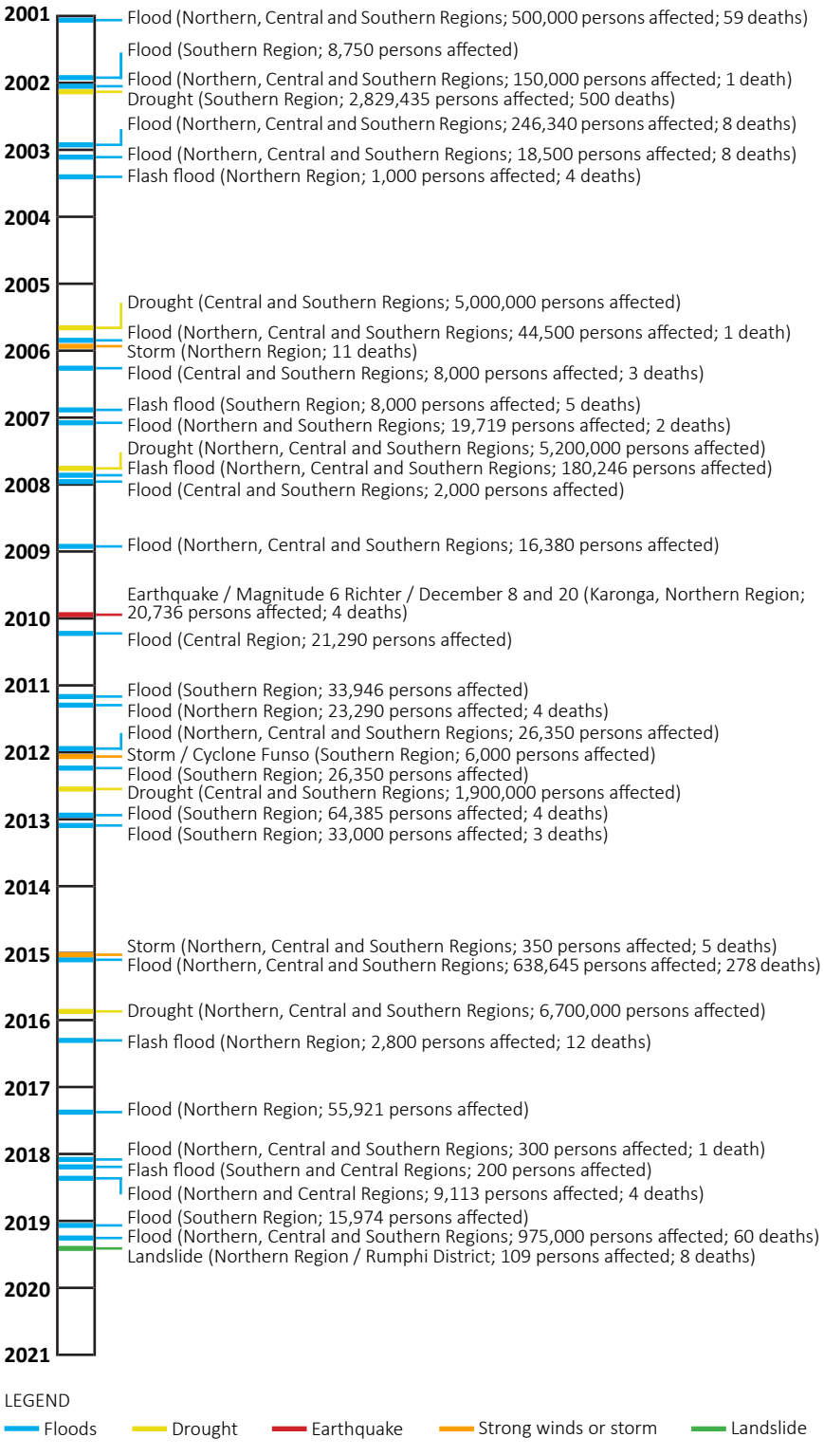
Combined drought hazard Index (1 in 100 year). © World Bank Group et al. (2019)



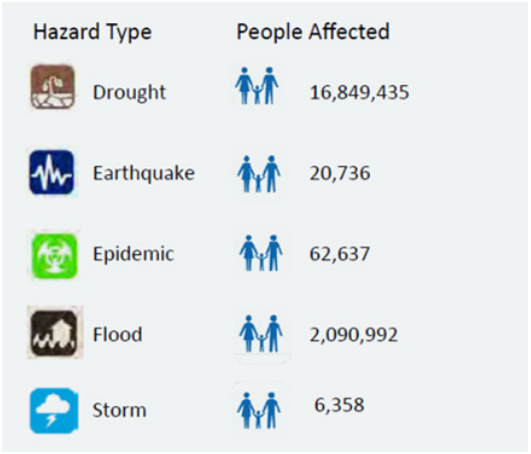
Earthquake hazard. 1 in 100-year peak ground acceleration (g). © World Bank Group et al. (2019)

C. TIMELINE OF DISASTERS (21ST CENTURY)

Within the first 20 years of the 21st century several disasters have affected Malawi: 28 episodes of floods (5 of which were flash floods), 5 droughts, 3 storms, 1 earthquake and 1 registered landslide.



Source: EM-DAT- The International Disaster Database (https://www.emdat.be/database)



Malawi Hazards Impacts from 2000-2016.
© Pourazar (2017)

Disaster	Number of recorded events
Floods:	279
Droughts:	30
Strong winds/storms:	164
Hailstorms:	52
Fires:	9
Earthquakes:	3

Number of disaster events as recorded in the National Profile for disasters, 1946-2013.
© Department of Disaster Management Affairs (DoDMA)

TO FIND OUT MORE

On section 2.3.

- MALAWI HAZARDS AND VULNERABILITY ATLAS
  -> Macharia, D. et al. (2015)
- DISASTER RISK PROFILE: MALAWI
  -> World Bank Group. et al. (2019)
- EM-DAT- THE INTERNATIONAL DISASTER DATABASE
- SHELTER CLUSTER MALAWI
- RELIEF WEB MALAWI
- HUMANITARIAN RESPONSE MALAWI

D. Everyday hazards and health related events

Everyday hazards and health related events cannot be classified as disasters, but they have great impact in the population of a given area. They are not caused by a specific physical event (as in a flood or earthquake), and they do not involve damage to property (UN-Habitat, 2020a). These include for example diseases related to poor water quality and inadequate sanitation provisions, malaria, health problems due to unsafe fuels for cooking and lighting, traffic accidents, drownings, or politically-linked violence (UN-Habitat, 2020a).

Epidemic hazards, WASH-related diseases: the risk of epidemic outbreaks such as diarrhoea, cholera and dysentery is as high as the risk compounded by disasters such as flooding and drought (Pourazar, 2017). The country is densely populated and a majority of the population still lacks adequate water and sanitation facilities; therefore, WASH-related diseases are the second most common cause of child mortality in Malawi (Pourazar, 2017).

For instance, cholera is a hazard experienced primarily in the rainy season often in areas that are also prone to regular flooding (Hajat et al., s.d.). In rural areas, early warning systems are effective and functional: origin is established and teams mobilised by hospitals, clinics and the government to contain the spread of the disease and mass vaccination campaigns can be deployed if mandated at central level (Hajat et al., s.d.).

Respiratory diseases: it can be argued that the risk of premature death due to TB or acute respiratory infections is higher than that attributable to flooding (UN-Habitat, 2020a). For example, the 2014 records from Karonga District Hospital show 67 tuberculosis (TB) deaths and 32 deaths related to other respiratory diseases.

Malaria: it is endemic throughout Malawi with six million cases occurring annually (Macharia et al., 2015) and it is the third top cause of death and disability (DALYs) in 2019 all ages combined (IHME, 2019) and the sixth top cause of death in the country in 2019 (IHME, 2019). Malaria transmission is largely determined by climatic factors, including temperature, humidity, and rainfall and is higher during the rainy season in areas with high temperatures, particularly along the lakeshores and lowland areas of the lower Shire Valley (Macharia et al., 2015). Housing characteristics such as openings without protection or lack of ventilation and living habits such as not using mosquito nets to protect persons while sleeping also have an influence over the spread of malaria.

WASH-related diseases due to poor water quality and inadequate sanitation provisions are an important everyday hazard in the country. CC- Gregory S.

Gender-based violence: injuries resulting from gender-based violence occur daily (UN-Habitat, 2020a). Gender-based violence can be exacerbated during crises. An example of this happened during flood episodes in Chikhwawa (Southern region) according to UN-Habitat (s.d.): when people hurriedly evacuated from their houses and started to live temporarily in rescue houses, tents, classrooms, with fellow victims of the floods from other villages. Such a life with mixed sexes, age groups, and mixed behavioural trends led to other social pressures.

Road accidents: Malawi is one of the countries with more road fatalities per year: 31/100,000 inhabitants in 2016 (WHO, 2018).

Violence: it occurs periodically, usually during food distribution and political campaigns (UN-Habitat, 2020a).

Drowning in river/lakes: it mainly occurs in the rainy season (UN-Habitat, 2020a).

Wildlife-human conflict (Hajat et al., s.d.): wildlife in direct conflict with humans includes elephants, warthogs, hippos, crocodiles, baboons, wild pigs, etc. Given the unpredictability of the occurrence and challenges in response capability, effective early warning systems are a challenge. Localised warning of communities is done through village criers and messengers.

Armed rangers deal with threats from dangerous wildlife. They are called by phone, often by one of the local extension officers from forestry, agriculture or health. Rangers are responsible for a huge area and can take a long time to respond.

E. Environmental issues

Deforestation: forest cover reduced from 47% in 1975 to 36% in 2005 and currently there is a loss of 33,000 hectares per year mainly due to agriculture expansion, tobacco growing, and excessive use of biomass, which accounts for 88.5% of the country's energy demand (Ngwira & Watanabe, 2019).

While 62% of the land was agriculture in 1991, by 2008, the agriculture land had reached 70% (Ngwira & Watanabe, 2019). According to these authors, tobacco is ranked as the highest user of wood among non-household users.

The denudation of forests and woodlands is having broader impacts including: erosion, reduced watershed protection often on steep slopes and biodiversity loss (World Bank Group, 2018).

Soil erosion (World Bank Group, 2018): it is affecting about 61% of the entire land area in the country. Land management practices such as forest clearance and annual burning accelerate it. The associated erosion and flooding from these activities have a severe impact on the landscape and the livelihoods of local communities. Soil and water conservation technologies are not practiced by smallholder farmers in Malawi, and it is estimated that only about 12% of cultivated land has ridges on contour.

Exploitation of natural resources: the lack of many alternative income generation activities puts pressure on natural resources through reliance for livelihood; for example through fishing, hunting of wild animals and birds, and gathering and extraction of non-food products (Pullanikkatil et al., 2016).

Quality of water: the current state of water quality of some water courses (such as the Likangala River) makes it unfit for direct consumption without treatment (Pullanikkatil et al., 2016).

F. Climate change impacts

According to the Malawi National Climate Change Policy (2012), the country is impacted by climate change. It has experienced extreme weather events resulting in droughts and floods, which have negative social and economic consequences (Macharia, 2015). Moreover, climate change may exacerbate the frequency and severity of future disaster events in the country (Pourazar, 2017).

Adaptation is essential, as climate change impacts disproportionately affect those least able to bear them (Macharia, 2015). Relying on small parcels of densely cultivated land for their livelihoods, rural Malawians are highly exposed to droughts and flooding whcih are increasing in frequency, intensity and unpredictability, giving the most vulnerable households inadequate time to recover (CRS, 2019).

Climate Change impacts are multiple in the country (Malawi, Ministry of Natural Resources, Energy and Environment, 2010):

- Agriculture (rain-fed): reduced productivity due to droughts; crop losses; scarcity of raw materials; malnutrition/famine;
- Water: availability/scarcity; reduced quality; lower hydroelectric power generation; waterborne diseases;
- Health: temperature trends and water availability; spread of malaria, diarrhoeal diseases, malnutrition;
- Gender: droughts affect availability of resources; women walk longer distances (to collect water, food and firewood); women nurse the sick;
- Energy: affected by droughts; scarcity of firewood; lower hydro-electric generation potential;
- Fisheries: affected by droughts and floods; reduced reproduction; loss of biodiversity; destruction of ponds;
- Wildlife: droughts affect water and food availability; reduced reproduction; migration;
- Forestry: reduced productivity due to droughts; land degradation; forest fires; loss of biodiversity;
- Environmental migration and a rural-to-urban migration flow in the medium to long term (Pourazar, 2017);
- Increase of poverty levels (Macharia, 2015);

An example of the impacts of climate change are the transformations in Shire River, of great importance to the country's economy, agriculture and fishery and also Malawi's main power generation source (Pourazar, 2017). In recent years, Shire River banks have been subject to severe land degradation and soil erosion as well as pollution from human and industrial waste, all of which have implications on the country's agricultural sector and food security, human health (disease outbreaks such as diarrhoea, cholera and malaria) as well as the electric power supply (Pourazar, 2017).

Challenges: Some of the challenges related to the ongoing climate change impacts are (Macharia, 2015):

- policy and institutional structures for effective coordination of climate change matters across the country and stakeholders;
- availability of climate-risk information;
- safety nets for those adversely affected by climate change;
- infrastructures to afford necessary resilience to climate change and efficient delivery of goods and services to vulnerable communities;
- focus on short-term emergency response (reactive) rather than solutions that build long-term community and ecosystem resilience.

Deforestation is one of the main environmental issues in Malawi. CC- Lucianf

2.4. Refugees and Internally Displaced Persons (IDPs)

Sources: CIA World Factbook (2020), CRS (2018), International Displacement Monitoring Centre (2020), UNHCR (2020)

Refugees: in 2019, there were several thousands of refugees and asylum seekers in Malawi. The most numerous were (CIA World Factbook, 2020): Democratic Republic of the Congo (29,007 persons); Burundi (8,752 persons); and Rwanda (6,606 persons).

Most of those of concern to UNHCR lived in Dzaleka refugee camp, which had a population of nearly 34,000, near the capital Lilongwe (UNHCR, 2020). More than 3,000 Mozambican asylum-seekers are in Luwani refugee camp, in the south (UNHCR, 2020).

Internally Displaced Persons (IDPs): displacement means that the social cohesion is disrupted and self-help spirit of local villages is broken down (Government of Malawi, 2015). According to the International Displacement Monitoring Centre (2020), in 2019 there were 117,000 new displacements (individuals can be displaced several times) due to disasters (110,000 of which were due to Cyclone Idai), and there were 54,000 IDPs as of 31 December 2019.

The 2015 floods affected more than 1 million people and displaced closer to 343,000 people (International Displacement Monitoring Centre, 2020). Displacement sites were set up in public buildings (such as schools), where families received assistance from various actors (CRS, 2018). After the first few months, the focus shifted towards relocation: support for families to return home, and for the collective centres to return to their normal public functions (CRS, 2018).

TO FIND OUT MORE

On section 2.4.

- UNHCR (Malawi)
- International Displacement Monitoring Centre

Dzaleka refugee camp. CC- Dani Villanueva

3. Land, housing, construction and DRR sectors

3.1. Legal framework

Sources: Government of Malawi (2015, 2016b, 2017, 2019), Kloukinas et al. (2019a), Malawi Red Cross Society (2015), Manda (2015), Mlaka (2018), Mwathunga (2014), Ngwira & Watanabe (2019), Ramparsad (2015), Secretary and Commissioner for Disaster Management Affairs (2015), UN-Habitat (s.d., 2010, 2020b)

Introduction

This section provides an overview of the legal framework of the Republic of Malawi in 2021 regarding housing and Disaster Risk Reduction: laws, norms, regulations and recommendations.

The following information is not exhaustive and may evolve.

A. Land

Over the last few decades, the Government of Malawi has worked on the reform of the legal framework for land management. This process was initiated by a Presidential Commission on Land Reform in 1996. In 2002, the Malawi National Land Policy was approved, and in 2003 a Special Land Commission was constituted to examine all land-related laws. The recommendations of the Commission culminated in the passage of four pieces of legislation: the Land Act (2016), the Registered Land (Amendment) Act (2017), the Customary Land Act (2016) and the Physical Planning Act (2016) (Government of Malawi, 2019).

Land Policy (2002)

This policy seeks to ensure tenure security and equitable access to land and its sustainable use (UN-Habitat, 2020b). According to Mwathunga (2014), it aims to clarify and strengthen customary land rights; it is intended to secure land rights for the majority of Malawians living on land formerly under customary tenure; it allows all customary land to be registered and protected by law against abuse; it recognises inheritance as a legal manner of land acquisition (improving access to disadvantaged groups such as women, widows, and children); and it provides for regularisation of informal settlements. Even if the policy is quite ambitious, it has some weaknesses as stated by Mwathunga (2014), particularly regarding the fact that allocation critera such as income, ability to pay plot development charges, and ability to develop the land exclude the youth, the poor, women and vulnerable groups.

Land Act (2016)

It replaces the Land Act of 1965 and harmonises the legal framework with the aspirations of the Malawi National Land Policy (2002). Some of the most important aspects of the Act are (Mlaka, 2018):

- All land is vested in perpetuity in the Republic.
- "Traditional Land management Area" (TLMA) is an area registered within the jurisdiction of a Traditional Authority. Land Committees give advice on management of customary land in a TLMA and not allocation of land.
- "Customary estate" means any customary land which is owned, held or occupied as private land within a TLMA and which is registered as private land under the Registered Land (Amendment) Act (2017). A customary estate shall be allocated by a land committee to citizens of Malawi (individuals, families or groups) or to a partnership or corporate body, the majority of whose members or shareholders are citizens of Malawi. A customary estate shall be of an indefinite period/duration, inheritable and transmissible by will, subject to acquisition by government in the public interest.
- "Private Land" means all land that is owned, held or occupied under a freehold title, leasehold title, or as a customary estate registered as private land.
- "Customary Land" means all land used for the benefit of the community as a whole and includes unallocated land within the boundaries of a TLMA.
- "Public Land" means land held in trust for the people of Malawi and managed by government, a local government authority or a Traditional Authority – (e.g. government buildings, schools, hospitals, public infrastructure); national parks, forest reserves, recreation areas, historic and cultural sites; land vested in government as a result of uncertain ownership or abandonment; unallocated and communal land within a TLMA
- "Freehold" means an estate in land which is held in perpetuity.
- "Land for Investment" is land designated for investment purposes which shall be identified, published in the gazette and allocated to the Malawi Investment and Trade Centre Ltd which shall create derivative rights to investors.

Customary Land Act (2016)

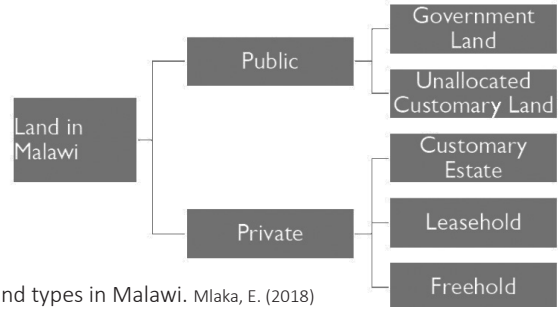
It allows the creation of Customary Estates, so that smallholder farmers in TLMA can get legal title to their land and thus be protected from encroachment and other interests including those of Traditional Authorities (Mlaka, 2018).

Registered Land (Amendment) Act (2016)

It provides for title registration throughout the country for all land categories including customary estates. All land shall be subject to registration for purposes of determination of ownership. It also provides for decentralization of land management. The ownership of family land has been eliminated (Mlaka, 2018).

Physical Planning Act (2016)

It lays the foundation for physical planning across Malawi. The Act declares the whole of Malawi as a planning area and includes provisions for national and local development planning and for granting development permits. It establishes provisions for the creation of a Physical Planners Board to register and regulate physical planners across the country (Government of Malawi, 2019).



Schema of land types in Malawi. Mlaka, E. (2018)

B. Urban and housing policies

National Urban Policy

Government is developing the National Urban Policy Malawi framework (funded by Cities Alliance with technical support from UN-Habitat) aimed at shifting national development from its rural focus to urban growth in the light of the rapid urbanisation (Ramparsad, 2015).

National Housing Policy

The National Housing Policy, originally drafted in 2007 is under review. It advocates for broad access to housing for all, decentralisation, improving urban land markets, upgrading informal settlements and improving the quality of rural settlements (Ramparsad, 2015).

Local Government Act (1998)

The current system of local government in Malawi is structured and functions in accordance with constitutional provisions, the Local Government Act of 1998, a significant 2010 amendment to the Act, and a host of other sectoral and thematic laws. Both the Constitution and the LG Act provide local governments with broad and wide-ranging political, administrative and developmental responsibilities. In terms of development, local governments are responsible for local planning, as well as for general infrastructure and service delivery (Government of Malawi, 2016b).

This Act obligates all assemblies to draw up plans for the social, economic and environmental development of their areas. Urban planning in Malawi has traditionally been based on the structure planning concept demarcating the urban space into land use zones (UN-Habitat, 2020b).

C. Water, sanitation and public health

National Water (2005) and Sanitation (2008) Policies

These policies aim to achieve sustainable, commercially viable and quality water and sanitation for all, always. The policies clarify roles of institutions in sanitation services delivery and guide development of interventions to meet global aspirations. The directorate of sanitation services in the Ministry of Irrigation and Water Development was established to oversee and coordinate sanitation and hygiene activities and initiatives in the country. However, urban centres face frequent dry taps while other centres and locations within centres remain unconnected and unserved (Manda, 2015).

Public Health Act

The law is meant to ensure adherence to environmental health. As important provision of this law, the Minister for Health has power to order demolition of buildings that fail to provide for adequate sanitary measures. Low income housing is seen from the view point of public health rather than as a development sector or right (Manda, 2015).

D. Forests and natural resources

Forest Act

The Forest Act is a tool for proper forest use and management of private, customary, and public land in Malawi. The Act prohibits for example the forest wood extraction for brick burning or tobacco processing. A study (Ngwira & Watanabe, 2019) shows that 97.7% of the households are unaware of the prohibition of forest wood extraction for brick burning and 97.8% of tobacco farmers are unaware of the prohibition of forest wood extraction for tobacco processing.

E. Construction

Malawi does not have construction policy or building regulations. According to UN-Habitat (2010), the construction industry works in a vacuum and lacks direction; there are loopholes in standards as regulations are fragmented; and District and City Assemblies have difficulty in formulating building bylaws.

UN-Habitat (2010) warned that there is a need to produce enough raw materials in an environmentally friendly way and manufacture enough components to both serve the existing local technologies and improve on them. UN-Habitat insisted that any temptation to raise standards or insist on all housing complying with draft building regulations should be avoided, as it would be both unrealistic and harmful.

National Building Regulations (work in progress)

The Government of Malawi has reactivated the development of National Building Regulations (a Draft was started in 1997). The Department of Buildings, under the MoTPW, is leading this work, in coordination with the Department of Housing, under the MoLHUD, and the DoDMA, under the Office of the President and Cabinet (Government of Malawi, 2019):

The draft National Building Regulations (1997) were developed by a Nairobi architectural firm and a United Kingdom civil and structural engineering firm. Positive features included (Government of Malawi, 2019):

- Fire provisions for building design.
- Requirements for geotechnical inspections
- Clear provisions for the change of use of buildings, with potentially important impacts on safety.
- Explicit references to testing of materials and products with appropriate focus on fire and structural requirements.
- "Deemed to comply" provisions, allowing for the recognition of local materials and methods of construction which is critical to lowering regulatory compliance costs and addressing the growth of informal construction. Nevertheless, the draft National Building Regulations (1997) do not recognise or provide guidance for the types of construction that low-income groups can afford. They make use of local materials and skills and are improved and extended incrementally as funding, time and materials become available.

The National Building Regulations are being developed with the following objectives: incorporating disaster and climate-resilient design in new and existing buildings; bringing consistency across Local Councils in dealing with risks in the built environment; incorporating modern objectives consistent with other development goals and policy areas such as physical planning; developing the basis for cross-sectoral training and professional development by leveraging the future building regulations as an educational tool. The Government has not decided whether to include provisions and/or guidelines for self-built constructions in the building regulations (Government of Malawi, 2019).

City Councils Building Bylaws

In the absence of National Building Regulations, some City Councils have regulated within their own jurisdictions. Most of the building bylaws were prepared in the 1960s and do not reflect the current building technology (UN-Habitat, 2010).

The country's largest cities currently rely on their own building bylaws. Malawi's first bylaws for building regulation were introduced in Lilongwe in 1961 based on the British Building Regulations of that time; while Mzuzu and Blantyre more recently updated and finalised their building bylaws in 2017 and 2018 respectively (Government of Malawi, 2019).

Safer House Construction Guidelines

These Guidelines (Bureau TNM, 2016), revised from a previous version prepared by the Government of Malawi in 2012. The Guidelines are the outcome of joint efforts by the Government of Malawi (Department of Lands, Housing and Urban Development, Department of Buildings, Department of Disaster Management Affairs), the World Bank, the Global Facility for Disaster Reduction and Recovery (GFDRR), UN-Habitat and other international consultants (Bureau TNM), (Kloukinas et al., 2019a).

The Guidelines serve as a standard reference for the informal housing construction sector (Kloukinas et al., 2019a) and are more appropriate for rural low-income groups (Government of Malawi, 2019). The Department of Housing has actively promoted the Guidelines across different cities in Malawi and urged Local Councils to adopt them as a form of subsidiary regulations or requirements attached to their respective bylaws. The Guidelines have been translated into local languages by the Department of Housing. The Department has also initiated trainings of Local Councils staff (Government of Malawi, 2019).

They include:

- illustrated instructions on how to build a small house resilient to all major hazards impacting Malawi;
- specifications for the production of essential local building materials: earth bricks, sun-dried adobe bricks, stabilised soil blocks, and concrete and mud plaster;
- recognise the process of incremental construction;
- and promote non-engineered forms of housing construction consistent with local building practices.

Other regulations and standards regarding construction

The following and several other statutes have a bearing on the built environment in Malawi:

Engineering Act (1971) / Architects and Quantity Surveyors Act (1992) / National Construction Industry Act (1996)

Malawi has taken steps to govern the practices of engineering, architecture, quantity surveying, construction and physical planning. In 1971, Malawi started to mandate registration and proof of qualification for engineers through the Engineering Act (1971). Similar legislation was established for architects and quantity surveyors, through the Architects and Quantity Surveyors Act (1992) and for construction workers and contractors through the National Construction Industry Act (1996) (Government of Malawi, 2019).

Occupational Safety, Health and Welfare Act (1997)

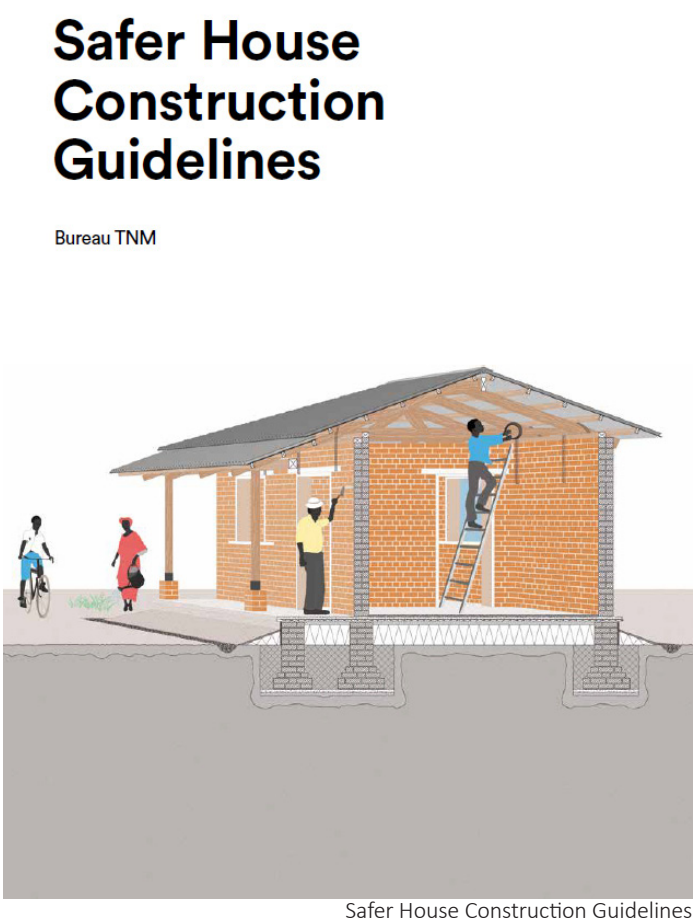
It includes provisions for fire preparedness (i.e. evacuation routes and fire extinguishers) and some provisions for fire prevention (i.e. ventilation) (Government of Malawi, 2019).

Malawi Standard Specification for Stabilised Soil Blocks (SSBs)

Malawi Bureau of Standards (MBS) has set the Malawi Standard Specification for SSBs. This specifies SSBs as a mixture of soil and cement or lime to certain proportions as a stabilizer with specified strengths and recommends three block sizes (190x90x75mm; 290x140x90mm; and 390x190x125mm) (UN-Habitat, 2010).

Sand, gravel, earth mining - quarries

No regulations have been found about this topic.



Safer House Construction Guidelines
Bureau TNM & Government of Malawi (2016)

F. Preparedness, post-disaster and climate change reduction institutional strategies and policies

Malawi Growth and Development Strategy (MGDS III) 2017-2022

The Malawi Growth and Development Strategy (MGDS III) is the overarching development agenda for the country. Disaster Risk Management and Social Support is Sub-Theme 7.2. The long-term goal is to reduce vulnerability and enhance the resilience of the population to disasters and socio-economic shocks. Different outcomes and strategies are stated in this document (Government of Malawi, 2017).

Disaster Preparedness and Relief Act (1991)

The Act mainly deals with the establishment of an institutional framework for disaster management, declaration of a state of disaster and the creation and management of a disaster appeal fund (Secretary and Commissioner for Disaster Management Affairs, 2015). It makes provisions for action required once a disaster has occurred (Pourazar, 2017).

National disaster risk management policy (2015)

The policy has been developed to guide DRM mainstreaming in the country by providing policy strategies that would achieve the long term goal of reducing disaster losses in terms of life and the social, economic and environmental assets of communities (Government of Malawi, 2015). The vision of the Policy is to have a national resilience to disaster. It bridges between disaster risk management and development planning (Pourazar, 2017).

The Policy has six priority areas (Secretary and Commissioner for Disaster Management Affairs, 2015):

1. Mainstreaming disaster risk management into sustainable development;
2. Establishment of a comprehensive system for disaster risk identification, assessment and monitoring;
3. Development and strengthening of a people-centred early warning system;
4. Promotion of a culture of safety, and adoption of resilience-enhancing interventions;
5. Reduction of underlying risks;
6. Strengthening preparedness capacity for effective response and recovery.

National Climate Change Management Policy (2016)

The Policy articulates areas of priority for climate change management in the country, as well as policy actions and programmes needed to address challenges of climate change. It should be instrumental in leveraging resources from the public and private sectors at national and international levels. It has been developed and designed within the context of national development priorities and is guided by principles set out in the Malawi Constitution, the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The principles include protection of human rights, gender equality, sustainable development, equitable development, the polluter pays, the precautionary and informed stakeholder and community participation (Government of Malawi, 2016c).

TO FIND OUT MORE

- International Disaster Response Law (IDRL) in Malawi: A study on legal preparedness for regulatory issues in international disaster response
  -> Malawi Red Cross Society (2015)
- Safer House Construction Guidelines
  -> Bureau TNM, (2016)

Rammed earth house under construction. © Jon Twingi

Veranda in Chitungulu, Nkhata Bay District (Northern Region). © Jon Twingi

3.2. Institutional framework

Sources: Government of Malawi (2015, 2016b, 2019), Kloukinas et al. (2019a), Malawi Red Cross Society (2015), Manda (2015), Namaona (s.d.), Pourazar (2017), Secretary and Commissioner for Disaster Management Affairs (2015)

Introduction

The aim of this section is to provide an updated overview about the institutional framework of the Republic of Malawi in 2020 as well as information on organisations involved in housing, shelter, construction, humanitarian response and education. This overview is not meant to be exhaustive and some stakeholders might be missing.

The following information is not exhaustive and may evolve.

A. National authorities and public agencies for land, housing and construction issues

Ministry of Lands, Housing and Urban Development (MoLHUD)

lands.gov.mw

The MoLHUD is responsible for providing policy direction, national standards and coordination for matters concerning land, housing and urban development. It is responsible for overseeing national, district and local physical development plans; land registration; national land surveying and mapping; and providing technical assistance to local Governments in these areas (Government of Malawi, 2019).

- Department of Housing: It is responsible for facilitating affordable, safe and secure housing for all income groups. It is responsible for managing urban renewal and informal settlement, for running home ownership schemes, etc. In terms of building and land-use regulation, the Department was instrumental in developing the Safer Housing Guidelines. It also participates on the development of National Building Regulations (Government of Malawi, 2019).
- Department of Surveys: It is responsible for land surveying and mapping in Malawi. Its mission is to make accurate, up-to-date and reliable geospatial information (including hazard maps) readily accessible (Government of Malawi, 2019).
- Department of Physical Planning: It is responsible for preparing and reviewing national, district and local (urban and rural) physical development plans. It provides technical assistance to local governments for the elaboration of their development plans. For most rural areas without a physical development plan, the Department is responsible for processing development permit applications. For planned areas, the Local Council is responsible for administering development permits (Government of Malawi, 2019).
- Department of Lands: It is responsible for the management of land and land based resources. Its services include providing land policy directions, managing land registration, land allocation and resettlement (Government of Malawi, 2019).
- Department of Urban Development: It is responsible for providing an enabling policy and institutional environment for urban development. It has an important role in creating policies to improve the capacity of local authorities for physical planning, to promote sustainable and resilient cities and support economic development and local job creation (Government of Malawi, 2019).

Ministry of Transport and Public Works (MoTPW)

motpwh.gov.mw

The MoTPW has the mandate of ensuring the provision of effective and sustainable transport systems, developing large-scale infrastructure and procuring policies and regulations on the built environment (Government of Malawi, 2019).

- Department of Buildings: It is responsible for the procurement and maintenance of public infrastructure and for providing policy direction and regulations for the built environment. It has responsibility for developing new National Building Regulations as well as supporting legislation in the form of a Building Act. The Department is responsible for overseeing the development and maintenance of public infrastructure which includes conducting site inspections during and after construction. The Department has the responsibility to provide architectural, mechanical and electrical buildings services, surveying, landscaping, and structural and civil engineering services. The Department also has some capacity for materials testing (Government of Malawi, 2019).

Ministry of Natural Resources, Energy and Environment (MoNREE)

mnrem.gov.mw

The MoNREE provides policy guidance and coordination on Malawi's natural resources, energy and environmental management. The following departments have a role in enabling the regulation of buildings (Government of Malawi, 2019).

- Department of Environmental Affairs: It issues Environmental Impact Assessments (EIAs) during the building design process. It is also tasked with reviewing applications for certain land-use modifications (Government of Malawi, 2019).
- Geological Survey Department: It has important expertise in the mapping of earthquake and landslide prone areas (particularly in the Karonga, Michesi and Zomba Mountains). These geologic maps constitute an important input into the development of risk informed National Building Regulations (Government of Malawi, 2019).

Ministry of Local Government

localgovt.gov.mw

It plays an oversight role on effectiveness of urban management by councils. Reflective of rural focus of national development strategies, the Ministry has no urban development directorate

but has directorates for rural development, local government services and chiefs administration. It also has power to confer status of township, municipality or city over any urban centre (Manda, 2015).

Malawi Housing Corporation

mhcmw.org

MHC was formed by an Act of Parliament in 1964 to construct houses and provide serviced land that may be used by developers to build their own houses. MHC offers its houses for rent. It also sells some of its housing stock to the general public. Circa 2008, MHC had built around 6,000 since 1964 in the urban areas of Blantyre, Lilongwe, Zomba, Kasungu and Mzuzu. According to MHC in 2007-2008 the demand for their housing was estimated over 100,000 in urban areas countrywide, and they were planning to build around 500 units and develop 316 serviced plots in that year. This speaks about a lack of capacity to meet the needs of construction of housing by the Corporation (Namaona, s.d.).

Malawi Bureau of Standards (MBS)

mbsmw.org

The MBS is a statutory organisation established in 1972 by an Act of Parliament. Its mandate is to promote metrology, standardisation and quality assurance of commodities, including their manufacture, production, processing and treatment.

In terms of building regulation, the MBS is responsible for setting construction standards. The Standards Act (1972) includes a list of relevant standards that the Bureau is responsible for maintaining. The MBS has previously established technical committees to develop standards, including in areas relevant to construction (e.g. pipes and fittings, bricks and tiles, cement and lime, electrical safety, timber products and iron and steel products) (Government of Malawi, 2019).

National Construction Industry Council (NCIC)

ncic.mw

The Malawi NCIC regulates and promotes the construction industry in Malawi by registering firms, construction workers, contractors and construction materials suppliers. Since its establishment in 1996, it has registered professional firms and individuals in different categories. It currently lists over 400 members in its directory.

NCIC carries out inspections on projects, verifying that contractors and consultants are registered and that they are operating within their authorised capacity. As per the NCIC Act (1996), the NCIC can impose a fine and issue warrants for arrest when they identify non-compliance.

The NCIC also plays a broader role in supporting the development of national policies, legislation and standards related to the construction sector. It works as a liaison with multiple stakeholders in the sector to identify building standards that need to be developed and those that need to be further promoted to encourage compliance. As a result of this initiative, in coordination with the MBS, a code of practice for design loadings for buildings was created in 2010 (Government of Malawi, 2019).

View of the city of Lilongwe. CC- Plougmann

B. Disaster risk management framework

Department of Disaster Management Affairs (DoDMA)

dodma.gov.mw

It is a Malawi Government agency for improving and safeguarding the quality of lives of Malawians especially those that are vulnerable to and affected by disasters. It coordinates and directs the implementation of disaster risk management programmes in Malawi through overseeing disaster prevention, mitigation, preparedness, response and recovery activities.

It implements disaster risk management programmes in partnership with other governmental agencies (e.g. Department of Lands, Housing and Urban Development and Department of Buildings) and international aid organisations. These programmes are aligned with global initiatives for DRR and sustainable development (Kloukinas et al., 2019a).

National Disaster Risk Management Committee (NDRMC)

The NDRMC provides policy directions to the DoDMA on the implementation of Disaster Risk Management programmes. The Committee comprises principal secretaries of line ministries/ departments, the Inspector General of Police, the Commander of Malawi Defence Force, and civil society representatives (Secretary and Commissioner for Disaster Management Affairs, 2015).

National Disaster Risk Management Technical Committee (NDRM TC)

It is a multi-stakeholder committee. It serves as an advocate of disaster risk management; provides advice and technical support; and is the coordinating mechanism for mainstreaming disaster risk management into sustainable development policies, planning and programmes. It aims at contributing to the establishment and development of a comprehensive Disaster Risk Management System for Malawi. It is chaired by the Secretary and Commissioner of the DoDMA and is composed of designated senior representatives who are formally appointed to serve on the NDRM TC as the disaster risk management focal points for their government line ministries and departments, civil society organisations, scientific and academic institutions, the private sector, UN agencies, donor community and the media (Secretary and Commissioner for Disaster Management Affairs, 2015).

- **National Disaster Risk Management Technical Sub-Committees**: The NDRM TC establishes multi-disciplinary Technical Sub-Committees (TSCs) for proper coordination and guidance in the planning and implementation of disaster prevention, mitigation, preparedness, response and recovery programmes. The following TSCs have been established: Agriculture and food security; Health and nutrition; Water and sanitation; Early warning; Search and rescue; Education; Protection; Coordination and assessment; Media and publicity; Transport and logistics; and Spatial planning, shelter and camp management. The NDRM TC has the discretion to establish other TSCs (Secretary and Commissioner for Disaster Management Affairs, 2015).

Decentralized DRM Structures

Disaster Risk Management Committees (DRMC's) are responsible for coordinating the implementation of the policies at City, Municipal, District, Area and Village levels (Secretary and Commissioner for Disaster Management Affairs, 2015).

Civil Protection

It has an active role in Disaster Risk Reduction at District, Area and Village levels through Civil Protection Committees.

Humanitarian Country Team (HCT)

The Humanitarian Country Team comprises of Heads of UN Agencies, international and local NGOs, Government, and the Malawi Red Cross Society. This team is chaired by the United Nations Resident Coordinator (UNRC). The HCT is the highest level coordination outside government coordination structures (Government of Malawi, 2015).

Inter-cluster Coordination Forum

It was established when the Government adopted the humanitarian cluster system. Nine clusters exist to date: Health and HIV/AIDS; Nutrition; Water and Sanitation; Transport, Logistics and Communications; Agriculture; Food Security; Education; Emergency Shelter and Camp management; and Protection. Early warning is mainstreamed in all nine clusters. Each cluster is led by a government ministry/department, supported by a UN agency or the Malawi Red Cross Society as a co-lead partner (Pourazar, 2017).

Malawi Red Cross Society

redcross.mw

The Malawi Red Cross Society (MRCS) is established under the Malawi Red Cross Society Act of 1968 (MRCS Act).51 It is recognised as a voluntary aid society auxiliary to the public authorities. It outlines MRCS's objects, one of which is: "…in the case of catastrophes or public disasters, to provide the victims thereof with relief". The law also confirms MRCS's independence and voluntary nature (Malawi Red Cross Society, 2015).

A house during the floods in 2015. © World Policy

TO FIND OUT MORE

INTERNATIONAL DISASTER RESPONSE LAW (IDRL) IN MALAWI : A STUDY ON LEGAL PREPAREDNESS FOR REGULATORY ISSUES IN INTERNATIONAL DISASTER RESPONSE
-> MALAWI RED CROSS SOCIETY (2015)

C. NATIONAL AND INTERNATIONAL ORGANISATIONS

MAIN INTERNATIONAL ORGANISATIONS, NGOS, AGENCIES AND DONORS WITH SHELTER/HOUSING OR DISASTER MANAGEMENT ACTIONS

- Action Aid
- African Development Bank (AfDB)
- African Union (AU)
- CARE Malawi
- Cities Alliance
- CONCERN Universal/Worldwide
- COOPI
- Council for Nongovernmental Organizations in Malawi (CONGOMA)
- CRS
- Department for International Development (DFID)
- DIPECHO (Disaster Preparedness ECHO)
- FAO
- Global DRR Platform
- Global Environment Facility (GEF)
- Global Facility for Disaster Reduction and Recovery (GFDRR)
- GOAL Malawi
- Habitat for Humanity
- IFRC
- Irish Aid
- Norwegian Embassy
- Oxfam
- Plan international
- SADC DRR Platform
- Save the Children
- United Nations Development Assistance Framework (UNDAF)
- UNDP
- UN-Habitat
- UNICEF
- UNISDR
- USAID
- WFP
- WHO
- World Bank
- World Vision

MAIN NATIONAL NGOS WITH SHELTER/HOUSING OR DISASTER MANAGEMENT ACTIONS

- Centre for Community organization and Development (CCODE): involved in advocacy and house production.
- Malawi Homeless Peoples Federation: community-based organization involved in house production.
- Local NGOs: NASFAM; Malawi Enterprise Zones Association; Association for Rural Community Development (Arcod).
- Local Faith Based Organisations (FBOs): Blantyre Synod Development Commission; CADECOM; Christian Aid Of Malawi; Church Action In Relief And Development; Evangelical Association Of Malawi (EAM).

D. UNIVERSITIES AND TRAINING CENTRES

UNIVERSITIES

MUBAS: Malawi University of Business and Applied Sciences
http://www.mubas.ac.mw/

- Faculty of Built Environment
  http://www.mubas.ac.mw/faculty/faculty-of-built-environment
- Faculty of Engineering
  http://www.mubas.ac.mw/faculty/faculty-of-engineering

MZUZU UNIVERSITY
https://www.mzuni.ac.mw/

- Faculty of Environmental Sciences: Department of Built Environment
  https://www.mzuni.ac.mw/?page_id=849

VOCATIONAL TRAINING

According to UN-Habitat (2010), training authorities tend to be influential in setting standards despite having no statutory power to do so; through training builders, they can establish a way of doing things that becomes normal.

TECHNICAL, ENTREPRENEURIAL, VOCATIONAL, EDUCATIONAL AND TRAINING AUTHORITY (TEVETA)

https://www.teveta.mw/

TEVETA gives accreditation to training courses from technician level to level four (equivalent to diploma) in courses including carpentry and joinery, painting and decorating, general fitting, bricklaying, electrical installation, plumbing, welding fabrication, refrigeration and air conditioning, and woodwork machinery (UN-Habitat, 2010). As reported by this author, seven hundred students are trained per year on all courses, including some in industries other than construction.

3.3. Overview of land, housing and property issues

Sources: Centre for Affordable Housing Finance in Africa (2016), Culture Grams (2018), Government of Malawi (2019), Huang (2017), Kloukinas et al. (2019a), Malawi, Ministry of Lands, Housing and Urban Development (2015), Manda (2015), Mlaka (2018), Mpanga (s.d.), Mwathunga (2014), Namaona (s.d.), National Statistical Office (2017, 2019), Ngwira & Watanabe (2019), Ramparsad (2015), United Nations Economic Commission for Africa (2015), UN-Habitat (2010), World Bank Group (2018), Zeleza Manda (2007)

A. Land and housing tenure issues

The following information is not exhaustive and may evolve.

Land categories

There are two main land categories in Malawi (Ngwira & Watanabe, 2019; Government of Malawi-Land Act-, 2016):

- **Public land**: it is the land held in trust for the people of Malawi and managed by the government. Within public land, customary land makes the biggest part.
    - Customary land: it is used for the benefit of the community as a whole within the boundaries of a traditional management area. It is held or used by community members under customary law and is under the jurisdiction of the customary traditional authorities. The customary land makes up around 85% of the total land in Malawi
- **Private land**: it is the land that is registered as private under the Registered Land Act. The formal mortgageable tenure system covered in 2015 only about 8% of the land, and almost all of this land was in urban areas (Ramparsad, 2015).

Key players

The key players in the land sector are (UN-Habitat, 2010):

- **Department of Lands**: it allocates land and registers transactions in all land under its jurisdiction.
- **Other ministries**: they own sites for their purposes.
- **City Assemblies**: They control all THA land and some other land
- **Malawi Housing Corporation**: it owns extensive tracts for estate development (4,517Ha in four cities in 2001).
- **Private individuals and companies**: They have freehold or leasehold rights to land
- **Chiefs**: They control land on behalf of the traditional land-holding communities.

Formal land occupancy

Of the total number of housing units occupied, 85% were owner or family occupied, 12% were rented and 2% were institutional (National Statistical Office, 2019).

There are four legal categories of land occupancy in Malawi (Mpanga, s.d.):

- **Membership of founding lineage**. According to Huang (2017), in order for family-owned land to be sold, it must first be approved by the village chief and the landowner's entire family, as each family member should receive a part of the profit.
- **Inheritance**: where an individual who is related to the founding lineage inherits a building or land. According to Huang (2017), in rural Malawi land is not often sold and bought, it is passed down. Thus, land ownership is based on family inheritance.
- **Occupancy through purchase**: where an individual who is not related to the founding lineage buys a building or land to build his dwelling. Huang (2017) states that in the case of larger building works, the project leader must simply canvas the community for anybody willing to sell a portion of their land.
- **Occupancy through rent**: the rent is usually paid to the one who claims ownership. Rental is much more common in urban areas, as it is the case for 46% of households but only 5% in rural areas (Ramparsad, 2015). According to UN-Habitat (2010), rents for housing varied in 2010 from MWK 350,000 to 500,000 (USD 2,500 to 3,600) per month at the very top of the market in Area 43, Lilongwe, to MWK 5,000 (USD 35). As reported by UN-Habitat (2010), subsidised rents for new Malawi Housing Corporation (MHC) housing started in 2010 at MWK 1,500 per month for a studio, which would fetch MWK 5 to 8,000 per month in the market, with a two-bedroom dwelling renting for MWK 10,000 per month (MWK 5,600 for the older ones) which would fetch MWK 20,000 per month in the market.

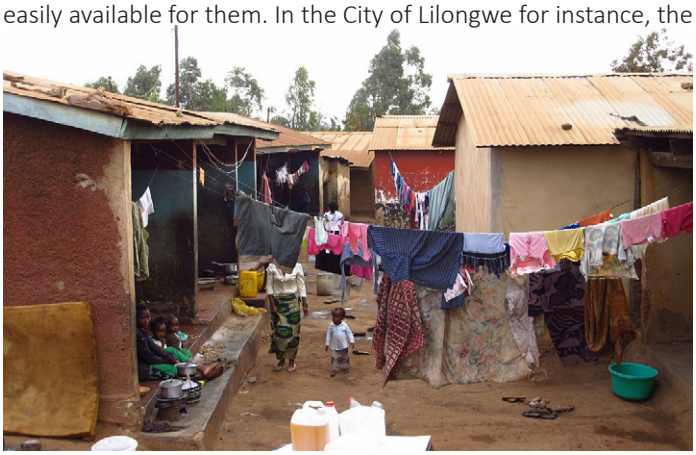
	Malawi		Northern Region		Central Region		Southern Region	
Housing Occupancy	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Housing Units	4,805,431	100.0	565,331	100.0	2,098,353	100.0	2,141,747	100.0
Owner occupied	4,089,937	85.1	472,895	83.6	1,784,474	85.0	1,832,568	85.6
Rented	554,738	11.5	66,523	11.8	246,430	11.7	241,785	11.3
Institutional	90,642	1.9	15,655	2.8	39,232	1.9	35,755	1.7
Other	70,114	1.5	10,258	1.8	28,217	1.3	31,639	1.5

Housing units occupancy, 2018. © National Statistical Office (2019)i

According to the National Statistical Office (2017), there is an increasing trend in the proportion of households occupying free authorized dwelling units jumping from 5% in 2010 to 10% in 2016. There is also an increase in the proportion of households occupying free not authorised dwellings from 0.2 in 2010 to 1.2 in 2016.

Informal land occupancy

It is difficult for the low-income groups to get a good house through rent or purchase, particularly in cities where land is not easily available for them. In the City of Lilongwe for instance, the



Dense settlement of Mwenyekondo, Lilongwe. © Urbanopolista

poor constituted over 78% (circa 2008) and they lived on less 20% of land area (Mpanga, s.d.).

Many low income families resort to informal means of acquiring plots (Mpanga, s.d.):

- **Through traditional chiefs or informal landlords**. Provisions included in the Chiefs Act (1967) specify that traditional or customary authorities have no jurisdiction in urban areas. Despite this, customary law is deeply rooted in land practices and considerable areas of cities are managed by chiefs (village headmen or block leaders): approximately 10% in Blantyre and Lilongwe, 75% in Mzuzu and 90.5% in Zomba (Government of Malawi, 2019).

  Under customary law, the chiefs or block leaders do not sell land; rather, they can act as intermediaries between sellers and buyers, be witnesses in land transactions or preside over land disputes. Customary lands are mainly used for agriculture, but the scarcity of lowcost land in urban areas has increased their demand and price for housing and business purposes. Similarly, the scarcity of low-income housing has forced people from urban areas to get land in unplanned settlements where customary practices are in place, limiting their options to obtain formal ownership documents (Government of Malawi, 2019).

  Also, according to Mwathunga (2014), constraints faced by planning authorities coupled with some people's perception of the illegitimacy of the state to control urban land, has given more field to *dobadobas* (middlemen, conmen and tricksters). They have taken over to contest planning practices of the state by employing different tactics to appropriate and defend their claim for urban spaces, generating conflicts between the state and users of space.

- **Squatting and land invasions**: Many settlers occupy public or private land. They live in settlements usually unplanned (Mpanga, s.d.). According to Mwathunga (2014), squatting and land invasions on urban land have remained one of the widespread struggles for space in urban Malawi, and these facts reflect the inability of urban planning and land policies to provide land and housing to the majority of urban dwellers.

Finally, there is also a part of the population who cannot demonstrate formal tenure.

- **Natives who cannot afford tenure formalisation**: According to Mwathunga (2014), the majority of the landless urban populations are low income population. The requirement for a certificate as evidence of land ownership continues to dispossess the natives of urban areas of their land because they cannot produce formal documents as they cannot afford to pay for the process of tenure formalisation.

Responses to informal occupancy

According to Mwathunga (2014), there are increasing cases of conflicts and competing claims over urban land including land dispossessions, conflicts over land uses and contestations manifested in squatting and land invasions on state land leading to growth of spontaneous settlements. In urban areas, efforts to address these competitions have included relocation, titling programmes, sites-and-services schemes, land reform programmes, and forced evictions, but struggles such as squatting and land invasions persist (Mwathunga, 2014).

Women and children

Security of tenure for women is formally ensured by the Land Act 2016 and Customary Land Act 2016. According to Mlaka (2018), in determining whether or not to grant a customary estate, a land committee shall have regard to equality of all persons and "treat an application from a woman or a group of women (…) no less favourably than an equivalent application from a man, a group of men or a mixed group of men and women".

Moreover, the same author states that a surrender of customary estate aimed at impeding women and dependents below the age of 18 from occupying land will be rendered invalid under these Acts. Surrender of customary estate should be accompanied with evidence that all dependents as well as those who have derivative rights are aware of surrender. A surrendered customary estate will be offered to the following in the order they are before it is publicised: 1. Husband/wife/wives in order of seniority; 2. Children over the age of 18; 3. Other dependents.

Also, according to the World Bank Group (2018), the Deceased Estates Act voted in 2011 gives spouses and children the right to inherit the marital estate in case of the death of a husband.

However, the actual implementation is still limited due to gender norms and cultural barriers, leading to women's inability to own, dispose of, and inherit property (World Bank Group, 2018).

According to UN-Habitat (2010), in the formal sector land allocation individualistic ownership system it can be easy for widows to be turned out of their home by other family members, even though the law protects them in theory. The informal sector would be more sensitive to gender and children issues. For example, in a context of many parentless households, as a result of the HIV/AIDS pandemic, the community within an informal area is likely to protect orphaned children's homes better than in the formal sector, where people tend to live more individualistic lives (UN-Habitat, 2010).

Persons with disabilities

Security of tenure for persons with disability is formally ensured by the Land Act 2016 and Customary Land Act 2016. According to Mlaka (2018), in determining whether or not to grant a customary estate, a land committee shall have regard to equality of all persons and "treat an application from (…) a person with disability or a group of persons with disability no less favourably than an equivalent application from a man, a group of men or a mixed group of men and women".

No discrimination

According to Mlaka (2018) the Land Act states that it is forbidden to adopt or apply adverse discriminatory practices or attitudes towards any person who has applied for a customary estate.

TO FIND OUT MORE

New Land Law overview: key changes
-> Mlaka, E., (2018)

B. Housing sector

The right to housing involves issues of secure tenure, equity, prevention of eviction, elimination of homelessness and participation (Malawi, Ministry of Lands, Housing and Urban Development, 2015).

Informal housing

According to Kloukinas et al (2019a) informal construction accounts for more than 90% of housing in the country, as access to formal housing is too expensive for most of the population.

Kloukinas et al. (2019a) state that the majority of the households have to cover their housing needs by their own means and with limited access to loans and micro-financial tools. In fact, individual builders dominate housing construction, with 90% of houses self-built (Ramparsad, 2015). Most people rent a house or own one in the informal sector, as it can provide houses about 60 times cheaper than the formal sector (Ramparsad, 2015).

In cities, lack of affordable housing forces low-income groups to erect poor houses in informal settlements (Mpanga, s.d.).

The construction of houses is regulated by the Department of Housing under the Ministry of Lands, Housing and Urban Development, in collaboration with DoDMA and Department of Buildings among others. However, due to lack of resources, it has proved difficult for the Department of Housing to implement its mandate. Much of the population in rural areas lacks the required information and skills related to the construction of houses in accordance with government construction standards (Government of Malawi, 2019).

The informal sector includes the following forms (UN-Habitat, 2010):

- **Informally constructed dwellings on formally subdivided land:** This is the case for example of traditional housing areas or THAs, which provided a planned framework within which recent migrants could build their own houses according to their financial standing. The approach was adopted to facilitate the provision of as many houses as possible, as quickly as possible and as cheaply as possible (Zeleza Manda, 2007). THA standards were deliberately kept to a minimum so that the beneficiaries could build any type of house with a chance of improving it later (UN-Habitat, 2010). In three decades, by 1980, a total of 30,000 THA plots had been provided in urban areas.

Because of the "first come, first served" criterion for the occupation of the plots, houses are now for rent rather than owner–occupation, as allottees sell off plots to higher-income groups, or as city authorities change allocation principles to repay loans on time (Zeleza Manda, 2007). The programme was discontinued in the 1980s so informal settlements became the only place for low-income households to find land to build their dwellings in cities. Today, officially, there are three types of THA (UN-Habitat, 2010):

  - THA normal: 400 square metres fully served plots for high-income families as charges are priced for full cost recovery;
  - THA basic: plots of 225 to 350 square metres with very basic infrastructure were charges are paid over at least 10 years;
  - THA layout schemes: non-serviced plots of 225 to 350 square metres to be serviced when funds are available. The idea is that secure land tenure enhances the chance of housing investment by people without regular income
- **Informally subdivided land on which housing is built.**
- **Dwellings built without planning and/or building regulations approval.**
- **Informal sector construction artisans involved in building dwellings.**
- **Informal extensions to formal housing.**

Formal housing

The informal sector process is consumer-friendly, even if it may lead to uncertainty about tenure in the future. In contrast, the formal, cadastral-based system is complex in matters of time, cost, bureaucracy, etc., but results in a secure title. The majority of the population opt for the informal sector because of the urgent need for housing and the affordability which surpass the long-term security advantages (UN-Habitat, 2010).

Therefore, formal housing constitutes a relatively small amount of the housing stock, less than 20 per cent in urban areas and only 5 per cent in rural areas. In fact, high-quality and standard housing provided by the formal private construction sector is affordable only to the top 1% of the population and serviced houses from the formal public housing programmes, (4–10 times cheaper) are affordable only for the upper 20% (UN-Habitat, 2010).

Malawi has the highest increase in urbanisation rate in the world with about 6% per year (Kloukinas et al., 2019a). In urban areas, only 20% of the houses are delivered through the formal sector (Manda, 2013). This leads to increased demand for formal housing in these areas; approximately 21 000 new units are needed every year to meet housing demand, what exceeds supply (Ramparsad, 2015).

Annual household income and access to formal housing in Malawi in 2015.

KEY PLAYERS IN THE CONSTRUCTION OF FORMAL HOUSING (Ramparsad, 2015; Zeleza Manda, 2007):

- **Malawi Housing Corporation**: main public provider (see 3.2). According to Ramparsad (2015) it had only achived 7 000 units countrywide from 1964 to 2015, and according to Zeleza Manda, only 10 000 units from 1964 to 2007.
- **Decent and Affordable Housing Subsidy Programme**, (known as the **Cement and *Malata* project**): public programme launched in 2014. The programme is allocated MK7 billion (US$12.6 million) annually.
- **Government entities**: several public entities, notably the Ministry of Defence and the Malawi Police Service, provide housing for employees.
- **Private housing providers**: they are mostly oriented towards middle and high income families (e.g. Press Properties Limited, Kanengo Northgate, NICO Assets, Knight Frank, Lilaga Communities, among others).
- **Malawi Homeless People's Federation** with the support of Centre for Community Organization and Development (CCODE). The Federation is a social movement comprising a number of savings groups formed in communities in slums. Federation members are mostly women and men currently renting houses (because of a lack of access to land for housing). It was created in 2003 to undertake community organization and mobilization, with a focus on increasing access to land, but later also to housing (Ramparsad).

  The Federation together with the NGO CCODE work in reaching out to professionals and policy makers, ensuring there is adequate information on the poor, and promoting the inclusion of the poor in the formulation of interventions on housing, water and sanitation, employment opportunities and other initiatives. This enables the poor to develop their own initiatives and contribute to policy development.

  Malawi Homeless People's Federation created the Mchenga Fund, a housing finance arrangement (see section C. Access to credits and loans).
- **NGOs**: Low income families might receive housing assistance from NGOs or associations. For example, Habitat for Humanity Malawi, operational since 1986, has provided housing solutions to low income families by facilitating the construction of new houses, repairs and rehabilitations. From 1986 to 2015, over 3 000 low-cost houses and latrines had been built.
- **Upgrading programmes in informal settlements**: They have been undertaken in selected towns for example in the cities of Lilongwe, Zomba, Blantyre and Mzuzu by the World Bank.

NOTIONS OF COST OF OWNING A HOUSE

The least expensive house in the formal market cost around MK7.5 million (about US$13 500) circa 2015 (Ramparsad, 2015). In that year around 60% of the population in Malawi lived on less than US$ 1.25 a day; therefore access to even the cheapest house is only available to highest income earners (Centre for Affordable Housing Finance in Africa, 2016) who make up less than one per-cent of the population (Ramparsad, 2015).

Differences in cost within the housing market are huge. Some years before, the cheapest MHC dwelling on offer in 2009 cost MWK 42,600 per square metre whereas the informal sector could build for MWK 750 per square metre in THAs. Thus, a 40 sq m MHC dwelling would cost MK 1.7 million (USD 11,190) and a THA dwelling would cost MWK 30,000 (USD 210) (UN-Habitat, 2020). This makes a difference of almost 60 times cheaper.

Also, a bit earlier, in 2007, each house built with the Mchenga Fund from the Malawi Homeless People's Federation cost between Mk 70,000 and Mk 100,000 (USD 490- USD 700) (Zeleza Manda, 2007), what makes them cheaper than MHC ones or private market ones.

Nonetheless, in Malawi (in both urban and rural areas), it is possible for low-income households to build an informal dwelling with little money because of the availability of land through traditional means and use of adobe bricks, gum poles and initial thatched roofing. Thanks to that, there is need to pay for very few initial inputs and these are affordable (UN-Habitat, 2010).

NOTIONS OF COST OF RENTING A HOUSE

Rent for a standard house in Lilongwe was (circa 2008) about K9,000 (US$ 64) per month while on average, low-income groups earned between MK3,000 (US$ 20) and K5,000 (US$35) a month (Mpanga, s.d.).

C. ACCESS TO CREDITS AND LOANS

GENERAL DATA

Data from the National Statistical Office (2017) show that between 2010 and 2016, there was an increase in the proportion of households where at least one member obtained a loan or credit for business or farming purpose in the 12 months prior to the survey from 8% in 2010 to 14% in 2016. There is a drop in the proportion of households who sought loans from neighbors across the three years from 17% in 2010 to 12% in 2016. In urban areas there has been a decrease in the proportion of those who borrowed money from commercial banks from 43% in 2010 to 7% in 2016.

According to Bah et al. (2018), less than 2% of the population in Malawi use mortgages to acquire their houses. Also, according to the Reserve Bank of Malawi, 1.1% in of all loans in 2013 were for real estate, and construction made up four% of all loans (Ramparsad, 2015). In fact, mortgages are very expensive in the country: in August 2015 the base lending rate was 32%; increasing by 2.5% if the mortgage finance is used for commercial or rental property (Centre for Affordable Housing Finance in Africa, 2016).

LOCAL SAVINGS GROUPS: *CHILEMBA* OR *CHIPEREGANI*

Access to credit through formal channels is very limited for low-income households and only less than 1% of Malawians qualify for a mortgage (Ramparsad, 2015). Saving is very difficult for these households too. That said, there are local, relationship-based savings groups called *chilemba* or *chiperegani* (UN-Habitat, 2010).

SAVINGS AND CREDIT CO-OPERATIVES (SACCOS)

Savings and Credit Co-operatives (SACCOs) are also common in Malawi (UN-Habitat, 2010): there are 66 SACCOs with 85,000

members in the Malawi Union of SACCOs (MUSCCO). There used to be many groups of between 30 and 70 women and men in a township who met together and encouraged each other to save. Nowadays, they have been merged and they are larger. They meet weekly and are mainly women. Members save daily, small amounts that are recorded in their savings books. Only a few SACCOs offered housing loans in 2010 while a few granted materials loans.

Malawi Homeless People's Federation has the Mchenga Fund, for housing funding. Members contribute with an amount per month (Mk 20 in 2007) towards this revolving fund, the main objective of which is to provide group loans to finance housing construction for federation members. The Fund had grown from about Mk 5 million in 2003 to more than Mk 120 million in 2007. Members' contributions are small, and so the fund is largely supported by external sources, but its importance lies in the fact that the members contribute. In 2015, there were more than 80,000 members in more than 100 groups (Ramparsad).

VILLAGE BANKS

Village Banks provide villagers with the opportunity to save and to access affordable loans in order to engage in profitable nonfarm and farm income-generating activities. These initiatives have a great potential to improve the socioeconomic welfare of vulnerable farming families and to enhance their resilience to natural hazards and the effects of the changing climate according to United Nations Economic Commission for Africa (2015).

In fact, 41% of those who obtained a loan sought it from Village Banks in 2016 compared to almost none in 2010 (National Statistical Office, 2017).

MICROFINANCE SECTOR

The microfinance sector is growing. According to Ramparsad (2015) Epik Finance was one of the microcredit agencies to enter the sector in 2014, specialising in housing finance and offering short term loans (18 months) to low and middle income earners, focusing on incremental building loans up to US$900 (MK500 000) per cycle.

TO FIND OUT MORE

VILLAGE SAVINGS AND LOANS
-> VAN DE MEERENDONK, A., ET AL. (2016). INTERNATIONAL LABOR ORGANISATION

VILLAGE BANKS REPORT, FINCA MALAWI
-> FINCA International (2016)

Region and District	Number of Households	Total Number of Household Saving	Method of Saving								
			Commercial Bank	Village Bank	Microfi-nance	Investment	Business	Mobile banking	At home/ family/ friends	Insurance Policy	Other
Malawi	3,984,981	912,976	285,305	449,789	4,940	1,821	7,515	117,318	33,533	399	12,356

Number of households saving and method of saving (2018)

Region and District	Total Number of Households	Total Number of Household Access Credit	Source of Credit					
			Commercial Bank	Village Bank	Microfinance	Employer	Family/ friends	Other
Malawi	3,984,981	547,319	51,085	416,089	30,126	4,947	19,586	25,486

Number of households access to credit by source of credit (2018)

3.4. CONSTRUCTION SECTOR

Sources: CRS (2015), CRS & CADECOM (2015), Government of Malawi (2019), Huang (2017), Kloukinas et al. (2019a), MacLean (s.d.), Ramparsad (2015), Tara (2014), Twingi (s.d. a), UN-Habitat (s.d., 2010)

This information is not exhaustive and may evolve.

A. FORMAL AND INFORMAL CONSTRUCTION

GENERAL DATA

In 2015, the construction sector contributed nearly 3% of GDP (Ramparsad, 2015).

As stated in the previous section, informal construction largely dominates in the country, attaining more than 90% of housing (Kloukinas et al., 2019a). Access to formal housing is reserved to a small part of the population due to high costs.

FORMAL SECTOR

The majority of formal constructions are developed at the instigation of their owners. The owner usually engages a small building firm or several individual artisans. Building contracting firms play a crucial role in the delivery of housing (UN-Habitat, 2010).

Working conditions of construction employees are not always very good. That is why for example on DFID (Department for International Development) funded contracts there is a package of extra clauses to improve the conditions of these workers. The clauses include: provision for workers fundamental rights such

as being paid at least the minimum statutory wage, protective clothing, periods of rest during the working day and safe clean water and first aid being available on site, and some extra clauses to extend the social aspects of construction to the areas of vocational training and H.I.V. prevention (MacLean, s.d.).

In formal construction, usually small local contractors are supplied by local producers and supervised by Malawian architects. The development of small contractors has positive advantages to the country, as it creates an active and lively local construction industry and improves the skills and capacities of construction workers (MacLean, s.d.).

Women are increasingly participating actively in contracting as builders and supplying local building materials to construction industry. The youth above 14 years of age (minimum employment age) are also employed as workers at construction sites and in loading and off-loading local materials such as river sand and hand-snapping gravel aggregate for concrete (UN-Habitat, 2010).

Informal sector builders and self-builders

Informal sector builders are responsible for the great majority of housing construction in urban Malawi and also for a good part of the construction in rural areas. Usually, they work during the dry season on fixed price contracts. Informal sector builders use little plant and machinery, utilising local materials often from the plot itself, and operate in a labour-intensive manner (UN-Habitat, 2010).

In the dominant informal sector, houses are generally constructed over a period of time, as families gain the resources to purchase the required materials. The dwelling is built in horizontal increments (all the foundations, walls, roof, etc.). Sometimes, the process may take several years to complete, particularly when industrial materials are used. Most houses in informal areas take weeks (or at the most months) to build, which is why these areas develop extremely quickly (UN-Habitat, 2010). The construction of new rooms is usually undertaken in separate buildings when there is space.

For constructions built by artisans, usually the master builder and the client agree on a price for each part of the construction. Afterwards they will arrive at the place for a preliminary site visit, to survey the land and review the project demands. Based on the outline of the house, along with their project design description, the master builder estimates the number of bricks required, which the client will need to purchase before building can proceed (Huang, 2017).

Also, in most cases, in rural areas and in low-income families, household's members will take part in different tasks of the construction of their dwellings: collection of materials such as thatch or grass, production of adobe bricks, fetching for water for the works, cooking for the builders, etc.

Apart from any hired labour that might be used by some owners, local materials can be employed at no cost or almost no cost (UN-Habitat, 2010).

In some cases, the family will build the house by their own means.

B. Construction skills

There is a growing demand for skilled and semi-skilled construction workers in cities, but according to UN-Habitat (2010) there seems to be no shortage of builders to supply housing at all levels except the very highest standard.

On the other hand, the Government of Malawi (2019) states that in the rural areas, people usually hire unskilled artisans to construct houses. In fact, the capacity of formal training institutions might not be enough to cover the needs of training in construction. Most apprentices learn by doing in the construction sites learning from experimented artisans, bricklayers, carpenters, etc.

According to Tara (2014), there are masons who can do good quality construction, even if the construction quality found in the country is variable. Unskilled artisans provide cheap labour, but the quality of their work is not always good (Government of Malawi, 2019).

C. Seasonal patterns and construction

Agricultural times usually condition building times, particularly when it comes to local materials. The dry season is the preferred season for building, as there are less agricultural works and more local materials ready to be used.

The dry season is from May to October. Within this, May to August is a cooler time of the year with sunshine and fresh evenings. Temperatures start to rise in September and remain high throughout the rainy season, which runs from November to April. Thatch is usually harvested in the dry season and thatching is often done right before the rains start by the end of October (Twingi, s.d. a).

In several interviews and assessments conducted by CRS and CADECOM after the episodes of floods in 2015 (CRS & CADECOM, 2015; CRS, 2015), it was found that all households intended to repair or reconstruct homes during the dry season using traditional building techniques and materials.

D. Units of measurement

It has not been possible to gather any relevant information regarding local units of measurement different from international ones (for surface, volume, lengths, etc.).

Stage of construcion of foundations of a house.
CC- Gregory S.

4. Overall description of local habitat

4.1. Households description

Sources: National Statistical Office (2017, 2019), Whiteside (2000)

A. Household composition and occupancy

Number of households and average household size

According to the National Statistical Office (2019), there were 3,984,929 households in Malawi in 2018, up from 2,869,933 in 2008, representing a 39% rise.

Average household size is defined as total household population divided by the total number of households in an area. The average household size for 2018 was at 4.4 persons per household, a marginal drop from 4.6 in 2008 PHC. The Northern Region had the biggest average household size of 4.8, followed by the Central Region with household size of 4.4 and Southern Region with household size of 4.3 persons per household in 2018.

Head of households

According to the National Statistical Office (2019) 2,583,775 households were male-headed (about 65%), while 1,401,211 were female-headed (35%) in 2018.

Number of rooms per person and overcrowding

A dwelling unit is considered to provide a sufficient living area for the household members if there are fewer than four people per habitable room (unstats.un.org/stgs).

According to the National Statistical Office (2017), there is an improvement when it comes to overcrowding in 2016 as compared to 2013. The proportion of households with four or more persons per room decreased from 20% in 2013 to 17% in 2016. In rural areas the situation improved with a decrease from 23% in 2013 to 19% in 2016. It also improved with a decrease from 13% in 2013 to 11% in 2016 in urban areas.

B. Livelihoods

Population by source of livelihood

Own-farm production is the most common activity for Malawians (Whiteside, 2000) and it is usually done together with other income generating activities by rural Malawians.

Other than own-farm production, in 2018 the population by livelihood sources was divided as follows (National Statistical Office, 2019):

- 36.6% of the population did *ganyu*, short-term rural labour relationships,
- 14.5% were entrepreneurs,
- 12.9% were employed,
- 12.5% sold food crops,
- 11% sold cash crops,
- 1.4% lived from remittances,
- 1.3% did petty trading,
- 1.1% lived from fishing,
- 0.8% lived from forestry products,
- 0.4% received a pension,
- 0.4% did public works,
- 0.4% received social cash transfers and,
- 6.6% had other sources of livelihood.

Ganyu

Ganyu are a range of short-term rural labour relationships, the most common of which is piecework weeding or ridging on the fields of other smallholders, or on agricultural estates (Whiteside, 2000). This author states that *ganyu* is the most important

Compound in Mwantothera, Nzimba. © Jon Twingi

source of livelihood for most poor rural households after own-farm production. There is a widespread practice of *ganyu*, and it is important to the rural poor as a component of the different activities which make up their livelihoods.

According to Whiteside (2000), for some households it may be even more important than own-farm production. It is a very important coping strategy for most poor households in the hungry period between food stores running out and the next harvest. Nevertheless, the need to do *ganyu* to obtain an immediate supply of food may conflict with own-farm production and therefore, while addressing an immediate crisis, it can carry to a vicious cycle of food insecurity.

Households with Livestock

Some rural households in Malawi own livestock. In 2018, the share of households owning different types of animals was (National Statistical Office, 2019):

- 33% of households had chickens,
- 18% had goats,
- 16% of the households had other poultry than chickens,
- 8% had pigs,
- 4% had cattle and
- 0.4% had sheep.

Household agricultural equipment

The distribution of households with agricultural equipment at home was in 2018 (National Statistical Office, 2019):

- 87.7% of households had a hoe or *panga* knife,
- 26.5% had a water can,
- less than 2% of households had a motorized pump or treadle pump or plough or ridge or fishing net or generator.

Household business ownership

In 2018, out of 3,984,981 households in Malawi, 651,357 households operated a business of some kind representing 16.3% of all the households. The share of households operating (including the type of business) or not operating any business was as follows in 2018 (National Statistical Office, 2019):

- 83.7% of the households did not operate any business,
- 7.2% of the households sold products in the same form that they were bought,
- 2.6% bought products to sell but added value before selling,
- 2.4% made products and sold them,
- 2.4% resold products after re-packing, re-grading or cooking, which entails light manufacturing, especially given that trading in foodstuff is widespread in Malawi,
- 1.1% grew and sold what they cultivated and
- 0.6% of the households had other business.

Assistance

In 2018, very few households received assistance in Malawi (only 8.7%). The share of population receiving assistance (including the source) or not receiving any assistance was as follows (National Statistical Office, 2019):

- 91.3% of the households did not receive any assistance,
- 2.9% received assistance from the government,
- 2.9% received assistance from NGOs,
- 2.2% received assistance from family or friends,
- 0.35% received assistance from international organisations and
- 0.16% received assistance from religious organisations.

Garden in a compound in Ngolomoti, Dedza. © Jon Twingi

4.2. Access to water, sanitation and other services

Sources: CRS (2019), Malawi, Ministry of Natural Resources, Energy and Environment (2010), National Statistical Office (2017, 2019), Ngwira & Watanabe (2019), O'Connell et al. (2016)

A. Water

Source of drinking water

Household information regarding sources of drinking water in dry season is used as an indicator of general population welfare of the country. In 2018 (National Statistical Office, 2019), the main source of drinking water during the dry season was as follows:

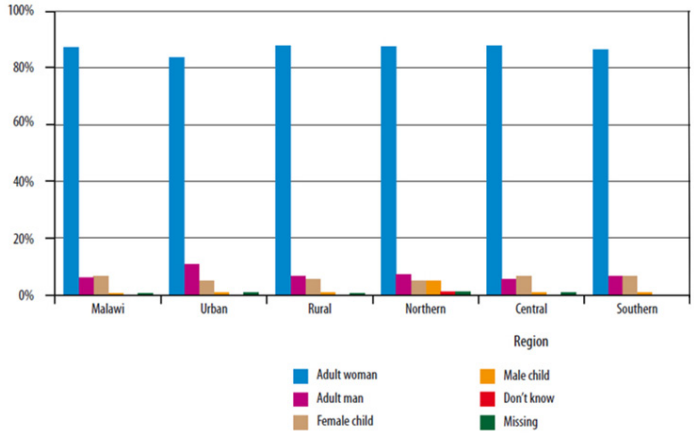
- 85.3% of the population used improved sources of drinking water including piped water into dwelling or plot (10.3%), community standpipes (8.1%), tube/protected wells (5.2%) and boreholes (61.7%).
- 14.7% of the population used unimproved water sources including unprotected wells (8%), 6.7% using water from springs, rivers, streams, ponds, lakes or dams, while 0.7% of the population used other sources.

Collection of water: a responsibility of women

In Malawi, women, men and children use water resources and systems differently due to practical and strategic needs and gender norms prescribed by society (Malawi, Ministry of Natural Resources, Energy and Environment -MNREE-, 2010). According to Malawi MNREE, women and girls are responsible for collecting water for cooking, cleaning, and washing and are therefore the primary managers of water and sanitation.

Water user associations and water committees

The informal settlements of cities like Lilongwe or Blantyre



Who is responsible for collecting water in Malawi, in urban and rural areas and in the different regions of the country.
Malawi, Ministry of Natural Resources, Energy and environment (2010)

communities (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).

From 2004, the Lilongwe water operator established a service dedicated to supporting disadvantaged customers, the Kiosk Management Unit (KMU), which according to authors like O'Connell et al. (2016), has become an efficient and operational system for managing kiosks by user associations. According to these authors, the KMU and water user associations have contractual agreements setting out the roles, responsibilities and expected results of the two parties. The user associations act as an access and intermediation mechanism between the Lilongwe Water Office and customers. With this system, people who have little income can have access to an improved source of water supply. These residents can daily buy buckets of water from the kiosk and pay at the point of sale avoiding connection fees and monthly bills.

The success of this system in cities like Lilongwe is proved by the fact that in 2016 about 65% of water services in poor peri-urban areas in this city were provided through water user associations (O'Connell et al., 2016). Nonetheless, the system also faces some problems such as transparency issues, failure to pay bills, and hygiene according to the Ministry of Natural Resources, Energy and Environment of Malawi (2010).

Also, water user committees exist in many rural areas. They usually manage boreholes with drinking water. For example, the water user committees in Phalombe and Thyolo districts collect user fees to prepare for operation and maintenance of the borehole when it breaks (CRS, 2019).

B. Sanitation

Type of toilet facility

In 2018, the share of users of the different types of toilet facilities in Malawi were diverse (National Statistical Office, 2019):

- 46.3% of the population had pit latrine with earth/sand slab,
- 28.3% used pit latrine without slab or open pit,
- 9.4% had pit latrine with concrete slab,
- 3.0% had flush toilet and
- 5.9% of household members used bush or field.

C. Electricity and fuel for cooking

Main source of energy used for cooking

The main sources of energy used for cooking in Malawi in 2018 were (National Statistical Office, 2019):

- 77.4% of the population used firewood,
- 18% used charcoal,
- 2% electricity,
- 1.1% used grass or straw and,
- 0.5% used other sources solar panels or paraffin.

This means that biomass accounts for 96.5% of the country's energy demand for cooking.

Main source of energy used for lighting

The sources of energy used for lighting were the following in 2018 (National Statistical Office, 2019):

- 52.9% of the population used batteries,
- 11. 4% used electricity,
- 6.6% used solar panels,
- 6.2% used candles,
- 4.4% used firewood,
- 2.1% used grass or straw,
- 1.7% used paraffin and
- 14.8% of the population used other sources.

D. Means of communication

Information on household effects and telecommunication was collected in 2018 (National Statistical Office, 2019):

- 51.7% of the households had a mobile phone,
- 33.6% had a radio,
- 16.4% had an access to the Internet,
- 11.8% had a television,
- 9.7% had CD/DVD or Hi-Fi player,
- 5.8% had a satellite dish and,
- 4.2% of the households had a computer, a laptop and/or a tablet.

E. Waste disposal

Disposal of waste can be problematic and create human and environmental health problems when it is not well managed (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).

In 2018, the distribution of households per type of waste disposal was as follows (National Statistical Office, 2019):

- 37.2% of the households disposed waste in open pit but not buried or burnt,
- 25.6% disposed it in the garden or near the house,
- 7.7% burned solid waste,
- 7.5% disposed waste in local dump not supervised by authorities,
- 5% buried solid waste,
- 4.2% had their waste collected on a regular or irregular basis either by authorised collectors or by self-appointed collectors,
- 2.3% composted solid waste,
- 2.3% disposed waste in rivers, lakes, creeks or ponds,
- 2% disposed their waste in local dump supervised by authorities
- 6.3% used other arrangements.

Water kiosk in Lilongwe where the residents (mostly women and children), queue for hours. CC- T. Sachin

4.3. Construction materials and techniques

Sources: Cleantech Malawi (2012), CRS (2018, 2020), Culture Grams (2018), Eco Matters Ltd. (2016), MacLean (s.d.), Narymbaeva (2015), Ngoma & Sassu (2004), Ngwira & Watanabe (2019), Pullanikkatil et al. (2016), Richardson (2010), Tara (2014), Twingi (s.d. a), UN-Habitat (2010), Wambua & Malunga (2014), Yager (2016)

A. Formal and informal sectors

All the building materials used by the informal sector, and many used by the formal sector builders are locally available in Malawi (UN-Habitat, 2010). Steel and cement are sourced from the formal sector, but most other materials come from the informal manufactures (Tara, 2014).

Tara (2014) states several aspects on the division of formal and informal sectors. For example, there are a few large companies that provide materials especially for roofing and flooring. However, almost the entire walling and about 60% of the other products market is accounted for with the informal sector. The informal sector makes use of labour-intensive, local technologies and materials costing very little or nothing (e.g. adobe bricks made from the site soil).

Production of adobe bricks in a peri-urban area near Blantyre. CC- Carmichael C.

B. Materials and techniques

Earth

There is a great tradition of earth construction in Malawi. Earth is used for the walls of most houses in rural areas (adobe brick, wattle and daub or rammed earth walls) and for many houses in peri-urban areas (mostly adobe bricks). It is also the most used material for floors and it is very much used in plasters.

Earth construction in Malawi has a wide range of qualities. Good quality models and constructions have been developed and adapted to local needs and ways of life over centuries (see chapter 5 for examples of good local practices). Despite this fact, nowadays earth is mostly associated with low income status (Richardson, 2010). For instance, the Malawi Bureau of Standards did not recommend earth as suitable material for urban structures' development (UN-Habitat, 2010). Good quality earth constructions are suitable for modern living standards, and there is a need to dissociate the image of poverty from earth construction. In fact, safe earth houses that meet people's living requirements can be built in a fraction of the time required for building a burnt brick house, enabling families to use their funds for the development of livelihoods (Richardson, 2010).

Wattle and daub house under construction in Chipita, Karonga. Bamboo framework and earth mortar. © Jon Twingi.

Earth is used in different forms:

Adobe or sun-dried bricks (*zidina*): these raw earth bricks with or without organic matter (straw, cowdung, etc.) are very common in the informal sector in both rural and urban Malawi. UN-Habitat (2020) stated different aspects of adobe production: they are usually produced on or close to the building site, often by the owner (sometimes particularly by women) and, therefore, they commonly have no or very little cost. Once the bricks are dry, they are set in earth mortar and sometimes plastered with earth or earth and lime mortar to improve durability.

Rammed earth house under construction in Chimombo, Ntchisi. © Jon Twingi.

Wattle and daub or earth on frame (*yomata*): a mixture of earth, water and sometimes organic fibres applied to a formwork is a common construction technique in some areas. Twingi (s.d. a) explains the ways in which frames are made using wood poles, reeds and bamboo, depending on the available materials in each place. Wood branches of all sizes are used as vertical and horizontal members, while wood poles are used as supports, especially on the corners. Stalks of bamboo are placed into the ground as vertical supports, while horizontal members are usually cut in half. Reeds are also used to construct these formworks.

Rammed earth (*mdindo*): rammed earth constructions are common in some areas and they are a living technique. Rammed earth walls are built compacting layers of a damp mixture of earth with suitable proportions of sand, gravel, clay, and sometimes stabilizer into a formwork (an externally supported frame or mold). In Malawi, the formworks are usually made of three pieces of wood joined together, usually with a bicycle chain (Twingi, s.d. a).

Woman plastering her house with earth plaster in Nkhombe, Kasungu. © Jon Twingi.

Earth plasters: earth plastering or smearing is a final layer (or layers) of mortar used to protect walls and floors against the elements. The mortar is usually made of earth and water, and sometimes it has additives such as organic matter or lime. Plastering is very common throughout the country and is usually completed once a year with earth from the place. In many cases it was stated that the earth was gathered from a place off site, what is done to have a specific or colour (Twingi, s.d. a).

Swamp earth or *dambo* mortar: people use dambo (swamp earth) as mortar between bricks. When dry, it hardens and is used without cement, this practice is present in both formal and informal sectors.

Earth paintings: decorations with paintings on the side of walls are quite common, and the colours are usually from the local soils (Twingi, s.d. a).

Earth floors: the floor of the house receives little attention by most families, even when upgrading a house. Most rural homes have earth floors (Tara, 2014).

Regarding Flooring, people in the rural areas use a mixture of cow dung and black soil, applied as screed, smeared with a stone which then hardens «like cement».

Stabilised Soil Blocks (SSB) / Compressed Stabilised Earth Blocks (CSEB): they are made with a mixture of earth (soil) and a small portion of cement or lime. Their use in housing is not widespread. The amount of cement required for stabilising depends on the nature of the soil. According to MacLean (s.d.), the blocks are compacted very often using a manual press and the field tests for selecting soils are well understood and that completed blocks are also tested for compressive strength using simple tests on site. The blocks are more often used in single thickness walls with the blocks laid in stretcher bond and therefore rely on having a concrete ring beam to prevent cracking and increase stability (MacLean, s.d.).

The use of CSEBs is concentrated in infrastructures (especially health and education buildings) funded by international organisations in Malawi with the objective of mitigating deforestation and other effects of climate change (Wambua & Malunga, 2014). Nonetheless, the Malawi Housing Corporation is also starting to use these blocks as they move away from the use of burnt bricks (Tara, 2014).

Burnt bricks and ceramic products

There is a strong tradition of manufacturing and building with burnt bricks (Tara, 2014). As reported by UN-Habitat (2010) burnt brick is the main material for formal housing and is also much used in the informal sector. Richardson (2010) states that with changing times, most people aspire to live in burnt brick houses. Bricks are often used for the construction of **walls** and **foundations** close to the place of manufacture to save in the cost of transportation (UN-Habitat, 2010). Even reducing transportation costs, an average burnt brick was sold between MK 3.50 to 5 in 2012 while a good quality product was sold between MK 15 to 25 (Cleantech Malawi, 2012), and therefore poor housholds can take up to 15-20 years to gather the funds to build a brick house (Richardson, 2010).

In 2012, there were only three organized brick industry producing good quality bricks (Cleantech Malawi, 2012). In fact, the production is very usually made on small scale traditional industries where the bricks are hand moulded in wooden moulds and fired in traditional clamps (UN-Habitat, 2010). Most of the clamps are small ranging from around 10,000 to 50,000 bricks capacity and there is no control over the firing process (Cleantech Malawi, 2012).

According to Cleantech Malawi (2012), the two major concerns in the brick sector (formal or informal) are increased deforestation due to use of fuelwood and poor brick quality, as due to high demand, all bricks produced are sold irrespective of quality.

Regarding the soils, in some cases black coloured plastic clays are used to produce good quality bricks, but on the other hand extremely poor quality sandy soils are also used (Cleantech Malawi, 2012). Cleantech Malawi also state that there are

Woman applying a red earth based painting in Chisi, Nzimba. © Jon Twingi.

Well maintained earth floor in Chitungulu, Nkhata Bay. © Jon Twingi.

Bricks are hand moulded in wooden moulds. Brick production in Benga, Mchinji. © Jon Twingi.

Traditional clamp in Zomba district. © Jon Twingi.

neither proper testing facilities nor knowledge on the suitability of soils in brick making.

Some technical issues in the burnt brick production include the following, as reported by Cleantech Malawi (2012). The bricks have different strengths depending on the intensity and time of firing and their position in the clamp. Faulty mould design and high water content deforms the just moulded bricks. Shapes are also distorted with drying cracks due to rough moulding area. Due to high plasticity of some soils there are high shrinkage cracks during initial drying. Besides fuelwood, fuel in the form of leafy biomass is also used, but the quantity and quality is not suitable to provide additional heat to uniformly fire the upper layers of the clamp:

Also, the working conditions in brick production are generally unhealthy, unsafe, there is usually no social security, and on an average a brick kiln worker earned around MK 250 per day in 2012 which was far less than the minimum subsistence amount (Cleantech Malawi, 2012).

Finally, UN-Habitat (2010) stated that there is a tendency for manufacturers to reduce the size of bricks without altering the price in order to make greater profits. This affirmation should be confirmed as per nowadays.

Ceramic tiles for floors are generally imported from India and China and are fast becoming a middle class market demand for floors (Tara, 2014). Terrazzo is also more and more used in floors.

Stone and gravel

Hand split stone and gravel is produced by small-scale artisans from the boulders that occur on the surface in many areas (UN-Habitat, 2010).

Split stone is used in **foundations** and plinths in the informal sector and set in cement or mud mortar, **gravel** is used in **concrete** structures (UN-Habitat, 2010).

Also, according to UN-Habitat (2010), there are large quantities of **gneiss** and **granite** suitable for cut stone walling and it is potentially as cheap as burnt brick walling. There are also large quantities of best quality **marble** in Zomba, Machinga and Balaka (UN-Habitat, 2010).

Sand

UN-Habitat (2010) reported that extraction of sand occurs at roadsides, on riverbanks and anywhere sandy soils can be found, usually in an uncontrolled manner and causing some environmental degradation. Most of the resulting sand is ungraded and may contain organic or other stray material. It is mostly used for cement based products.

Cement

All the materials to produce cement are available in Malawi (UN-Habitat, 2010). Yager (2016) reports that between 2011 and 2015, limestone production for cement increased by an estimated 290% and cement production, by an estimated 171%. In 2014, Malawi had three cement plants with a total production capacity of about 860,000 t/yr (Yager, 2016).

UN-Habitat (2010) stated that informal housing in Malawi consumes little cement as there is no customary use of cement blocks or beams and the only common uses of cement are cement-based mortars for burnt brick walls and brick or stone foundations and for screed cement floors.

According to Tara (2014), cement based products manufactured by the informal sector have great variability in the product quality, as the process is completely manual and they are usually produced without vibration or compaction.

Some of the uses of cement are listed here:

Cement mortar: it is the most important use of cement in Malawi, particularly used in joints of stone and burnt brick masonry.

High capacity clamp in Benga, Mchinji. © Jon Twingi.

Burnt bricks have different qualities due to the varying intensity, time of firing and position in the clamps. Bricks in Muwanga, Chitipa. © Jon Twingi.

Burnt brick wall with cement mortar being built in Kambewa, Mulanje. © Jon Twingi.

Mineral materials	Metric tons
Clay, brick[e]	1,400,000
Cement, hydraulic	550,000
Lime	110,000
Ornamental stone	8,000
Stone:	
Crushed for aggregate	1,300,000
Limestone, for cement	130,000

Estimated data of industrial production of mineral materials related to construction in 2015 (data available through August 11, 2016). © Yager (2016)

Reinforced concrete: cement and steel are available in cities throughout the country, but there is reluctance among developers to consider cement based technologies due to the high costs and lack of skills in executing these technologies (Tara, 2014). Despite these facts, reinforced concrete is becoming more popular in construction in the last years, particularly in urban areas but not only. Reinforced concrete ring-beam designs and reinforced beams and posts structures in institutional and private formal buildings are being built. According to Tara (2014), there is negligible use and demand of cement based roofs both cast in situ and pre-cast.

Concrete blocks: there is a slow shift from burnt bricks towards concrete blocks in the last years due to the usual low quality of burnt bricks, the local availability of stone and quarry dust and aggregate and despite cement being expensive (Tara, 2014). This author states that this is still a trend restricted to high end housing and institutional buildings.

Tara (2014) explains that the manufacturing of these concrete blocks is undertaken by the formal (large developers manufacturing blocks using hydraulic or manual machines) and more importantly by the informal sector (informal producers who manufacture and sell the blocks on the street sides).

The quality of the product is a concern, particularly because of a lack of cement dosage and an insufficient wet cure.

Microconcrete roof tiles: they are made from thin (8mm) vibrated unreinforced concrete which is cast onto a flexible membrane and then post formed on a mould into the required shape (MacLean, s.d.). They represent only about 10% of the share for industrial roofing materials and the informal sector is more prominent in this space (Tara, 2014).

They offer advantages over steel roofing sheets such as their thermal insulation and noise insulation, they have greater benefit to the local economy than imported metal sheets and is creating a small industry which can supply many other clients in the country (MacLean, s.d.). On the other hand, carpenters usually lack of ability to size and produce a framework adapted to the specific features of the tiles.

Screed concrete flooring: as economic and aspiration levels rise there is a movement towards screed concrete flooring, in such a way that this is the most common material in urban areas for flooring currently (Tara, 2014).

Concrete floor tiles: concrete tiles usually employed in external pathways of wealthy families are manufactured by few large units, but are most commonly locally produced and sold on street sides (Tara, 2014).

Other cement products: cement products like grills or sills are available along the major roads leading into the urban centres, being the quality of these products extremely variable (Tara, 2014).

Lime

Malawi has large quantities of limestone and 70% of the lime produced in Malawi is building lime (Eco Matters Ltd., 2016). Many small-scale entrepreneurs in Balaka and some other parts of the country manufacture lime. Eco Matters Ltd. (2016) describes the process of production of lime, which in Malawi is usually handmade by workers on a piece-rate basis.

It is commonly used as a **plaster** on the inside and outside of adobe walls (UN-Habitat, 2010) and the exteriors of homes are usually whitewashed (Culture Grams, 2018).

Gypsum

Eco Matters Ltd. (2016) state that in recent years, 60-70% of gypsum (POP) has been used in the manufacture of plaster boards for **partitioning walls** in multi-story buildings, but it is also used in the production of Portland Cement. Some high standard houses have gypsum **flat false ceilings** (Tara, 2014).

Stone breaker in Lilongwe. CC- ILO

Mixing cement, sand and gravel for concrete. CC- Gregory S.

Reinforced concrete construction in Lilongwe. CC- ILO

Lime is used for the whitewashing of earth constructions and also mixed with earth for plastering. Iuluma, Chitipa. © Jon Twingi.

4. Overall description of local habitat

Gypsum resources occur as low-grade deposits in *dambos*, swampy drainage courses accounting for over 40% of the Lilongwe and Dowa plains (Eco Matters Ltd., 2016). Also, according to this author, mining of gypsum is based on 2x2x2m of excavation each day by a team of 4 men.

There is a need to deepen on the comprehension about the production of gypsum, including industrial and/or artisanal practices.

Timber

Timber has many uses in construction in Malawi: **vertical poles for verandas and for supporting roofs, roofing trusses and frameworks, wall plates, lintels, doors and windows, door and window frames, wattle and daub structures, false ceilings** and other items. According to Tara (2014) the use of timber increases the pressure on deforestation and also if the timber is not adequately treated which is often the case, the quality of the construction suffers mainly because of termites attacks. There are some local methods to prevent termites' attacks, such as burning the poles before inserting them on the ground.

Informal sector construction uses gum poles from eucalyptus or similar species for roof timbers and roughly cut sections for manufacturing doors and windows and their frames (UN-Habitat, 2010). According to this author, eucalyptus trees are being discouraged in Malawi as they draw too much water from the ground and there might be a need to find other sources for rafters, etc.

Also, commercial timber is sourced mainly from Chikangawa in Mzimba and Nkhata Bay and is used locally and exported mainly to surrounding countries (UN-Habitat, 2010).

The most common use of timber is in roof structures. For timber frameworks, whatever is available is used (Twingi, s.d. a): large poles, small poles, and also bamboo or reed.

Timber has many uses in construction: vertical poles, roofing frameworks, wall plates, lintels, doors and windows, door and window frames, wattle and daub structures, false ceilings... Timber poles in Nisanje, Lilongwe © Jon Twingi.

Roofing frameworks are often built with timber poles (usually blue gum), but also with bamboo. Conical roof in Bushiri, Salima. © Jon Twingi.

Helpful trees to plant	Main Benefits	Where to Plant
Jujube, Catch Thorn (*Masao, Ma-sawo*)	Timber, fodder, medicinal, food/fruit	Near homes
Water Berry (*Mpani*)	Timber, fodder, medicinal, food/fruit	Riverbanks
Water Boom (*Nyowe*)	Timber, fodder, medicinal, food/fruit	Riverbanks
African Teak (*Mlombwa*)	Timber, medicinal, wind break/fencing	Afforestation of catchment, near homes
Common Bamboo (*Nsungwi, Mlazi*)	Timber, food/fruit, wind break/fencing	Riverbanks
Blue Gum (*Bulugamu*)	Timber, fuel	Near homes
Camel Thorn (*Msangu Sangu*)	Timber, fodder, medicinal, food/fruit	Cultivation area
Monkey Thorn (*Ngundanjira*)	Timber, food/fruit, wind break/fencing	Riverbanks
Woman's Tongue (*Mtangatanga*)	Timber, fodder, shade, riverbank stability	Afforestation of catchment, garden boundaries
Neem (*Nimu, India*)	Timber, fodder, medicinal, food/fruit, wind break or fencing	Garden boundaries, near homes, roadside
Monkey Bread (*Chitimbe*)	Timber, fodder, medicinal, food/fruit	Near homes
Gliricidia (*Gilisidiya*)	Wind break or fencing	Riverbanks, cultivation area
Sickle-Leaved Albizzia	Wind break or fencing/Erosion control	Riverbanks, Afforestation of catchment
Silky Oak	Wind break or fencing	Roadside
Red Mahogany (*Mbawa*)	Wind break or fencing	Roadside
African Locust Bean (*Mkundi*)	Erosion control	Meeting places, roadside
Kesha Wa Maluwa	Erosion control	Riverbanks, cultivation areas, gar-den boundaries
River Bean	Erosion control	Riverbanks
Indian Almond (*Bonifant*)	Erosion control	Near homes, roadside

This table shows different tree species which have a use for timber, construction, food or wind and flood reduction in Malawi. © Narymbaeva (2015)

There are gable roofs and hipped roofs, but also conical roofs in some cases. Roof structures are usually composed by a top ridge beam, which is the most important one because it is the largest in thickness and in length, and then rafters joining the ridge beam to the wall plates. When it is a hipped roof, hip rafters appear in the corners. Sometimes, the wall plate transfers the loads to the walls, but there are occasions where wood poles are used as columns and transfer the weight into the ground (Twingi, s.d. a).

There are also wood tiles, which are imported generally from South Africa and neighbouring countries and are more expensive than ceramic and concrete tiles and thus have a limited use (Tara, 2014).

Wooden frames are used for doors and windows. There are untreated and treated wood frames and the second ones are more scarce and expensive (Tara, 2014).

Some houses have flat false ceilings, including ply-wood ceilings (Tara, 2014).

Bamboo

Richardson (2010) states that bamboo is widely available in Malawi, the species grown vary depending on regional/climatic conditions and availability depends on location. Bamboo is already used as a construction material in Malawi and is less expensive than timber.

Twingi (s.d. a) explains that it is sometimes used in the **frameworks and trusses** of roofs and also as **structure in wattle and daub (yomata) houses or verandas**. Vertical supports are set into the ground and the tops are notched to support the horizontal member. The different bamboo elements are usually tied with string.

Sometimes, also the support members and the actual fill for the **windows and doors** are constructed with bamboo (Twingi, s.d. a).

Bamboo is also used as false ceiling.

Bamboo can be used to make trusses of up to 8 metres spans by local craftsmen and even self-made (Ngoma & Sassu, 2004).

Reed

Reeds are harvested annually in areas near lakes or rivers and are stored and dried before they are used. It is mainly used as a **down layer on roofs, in doors, windows, walls**, granaries, etc. Sometimes, reeds are bundled together to create **purlins**.

Reeds are tied together vertically with a horizontal member which is a piece of wood or bark for the manufacture of doors or windows which offer limited security and are mainly done for privacy (Twingi, s.d. a).

Grass or thatch

Thatch is mainly used as **roofing** material, but it is also used for **fences** and in granaries (Twingi, s.d. a). The majority of homesteads gather thatch, but some other purchase it. Tara (2014) states that in rural areas grass thatch is the most common material used for roofing. Even when they need to be replaced or repaired, this can still be an inexpensive option, undertaken by family and friends without hiring external experts (Tara, 2014).

According to Twingi (s.d. a) gathering thatch is not always an easy task, depending on the availability of it in a given area.

In some areas, the grass used for thatching is scarce these days as most land is being used for cultivation of crops (CRS, 2020). Also grass is a material that is only found in the dry season.

Thatch bundles are also found and are used as **roof supports, door and window frames, fences,** support for the bottom of granaries and for the granaries themselves (Twingi, s.d. a).

Bamboo is more and more used, for example in roof frameworks. Hipped roof in Dzipusile, Ntcheu.
© Jon Twingi.

Reed is used as bottom layer in many roofs. Roof in Chome, Rumphi. © Jon Twingi.

Women transporting thatch for a roof near Karonga.
© Sonia Molina

Thatch roof under construction in Sifukwe, Karonga.
© Jon Twingi

Steel sheets

As income levels rise, people aspire to move beyond thatch to a more permanent roof such as steel sheets, seen as the first step towards a better quality of life through housing (Tara, 2014).

Tara (2014) states that steel sheets account for about 80-90% of the formal market (excluding thatch) and that the informal sector accounts for 40-60% of the market. Tara also explains that all steel is imported, mostly from South Africa, since there are no steel producing factories in Malawi, but the profiling takes place within the country.

There are various profiles of steel sheets available (Tara, 2014):

- **Corrugated galvanized sheets** account for 50-70% of the market and are used mainly by low income households. They were among the first steel sheets introduced in the country.
- **Inverted Box Rib profiles (IBR)** account for 20-30% of the market and are preferred by middle income households. These profiles have a bold angular appearance and provide optimum load span consistency and good drainage capacity.
- **'Tile' profiles** account for the remaining 10-20% of the market and are used by high incomes households. They mimic the aesthetics of tiles while providing the ease of installation of steel sheets.

Corrugated galvanised steel or iron sheets are the most common metal roofing system in Malawi. Houses in Makala. CC- Hansueli Krapf

Steel

Steel **window and door frames** are used in urban areas. Particularly steel window frames have dominated the market, while steel door frames are less appreciated than wooden ones (Tara, 2014). According to Tara (2014), the frames in the informal sector are much cheaper and comparable in cost to good quality treated wooden frames, but most good quality steel frames are very expensive. Tara also states that steel frames are available along most major roads leading into the urban centres and that small fabrication units have sprung up to cater to the growing demand.

Also, industrial construction has shifted to **steel under-structures**, but this is not seen in residential homes due to the costs involved (Tara, 2014).

Bark used for connections in Chapita, Mwanza. © Jon Twingi

Connections

Connections are very important in construction. Twingi (s.d. a) cites some of the most usual connexions employed in Malawi:

- **Bark**: it is peeled off of a tree, dried and cut into strips. Before it is used, it is soaked in water to soften up.
- **Sisal**: it is a plant that is cut and dried and then used as straps.
- **Tire strips**: tires are cut into small strips and used for connections.
- **Mosquito netting**: nets are cut into strips and used for connections material that is taken right from the homestead.
- **String**: it is also utilized to tie pieces together and down.
- **Vines**: this material is taken right from the homestead when available and used to tie.
- **Nails and wire**: they are used in connections when it can be afforded.

Sisal is also used for connections. Makhoma, Dowa. © Jon Twingi

Additives

According to Twingi (s.d. a), there are several additives which are used together with earth, particularly for plasters and finishing:

- Natural **pigments** are sometimes added to provide different and unique colours to the plasters, even if most commonly the coloration is given by local earth colours.
- **Charcoal**: charcoal is another additive to earth plasters which produces a black color.

Plastic sheet membrane in a roof in Chipile, Mangochi. © Jon Twingi

- **Tree pods**: a tree species which it has not been possible to determine within this research has pods which when burned and then crushed create a black pigment used in plastering.
- **Ashes**: wood is completely burnt which creates a white color.
- **Battery Cells**: used battery cells are cut open and added to the mud. This gives the plaster a deep black color. There is a need to deepen on the comprehension of this practice, how common it is and what can be the impact of this pracice on health.

Plastic

Plastic is mostly used as **water-proof membranes in roofs and between foundations and walls**. It is sold in rolls and people just buy what is needed (Twingi, s.d. a).

In fact, many houses have a layer of plastic on the roof below the thatch and it seems that when houses do not have one is because the family cannot afford it (Twingi, s.d. a).

Asbestos

There is presence of asbestos **roofing** sheets in some of the older constructions in urban areas (Tara, 2014).

Other materials

According to UN-Habitat (2010), Malawi has to import metal and ceramic materials (pipes, sanitary-ware, electrical wiring and fittings, corrugated iron sheets, profiled roofing sheets, etc.), raw materials for plastic pipes and many types of tiles, and glass. These are imported from South Africa, Zambia, Tanzania, the United Kingdom, China and India.

Imported building materials are often in short supply at the top end of the market (UN-Habitat, 2010).

In some zones (e.g. Chaima, Dowa), used battery cells are cut and added to the mixture for earth floors. This can be a good practice regarding durability of plasters, but should be analysed also in regard to the health issues that it may cause. © Jon Twingi

C. Availability and affordability of construction materials

Availability of materials

Generally, despite the environmental issues of the production or extraction of some materials, there seems to be little or no shortage of the most used local building materials (UN-Habitat, 2010). There is a need to confirm if this situation has changed since 2010.

Affordability of materials

Forest resources on customary land are usually most accessible to the majority of the rural residents, and provide timbers/fuel wood for both rural and urban population (Ngwira & Watanabe, 2019).

Basic materials such as poles, thatching grass, bamboo, unburnt bricks are available and also most often economically accessible for most households (CRS, 2020) provided that they are present in a particular area and the seasonality of some of these materials.

Materials such as burnt bricks, cement and corrugated iron sheet roofing are often beyond the financial means of the poorest households (CRS, 2018). CRS stated (2018) that for wider impact, there is a need to focus on building solutions using affordable local materials, and that are replicable and achievable by the most vulnerable and at-risk households.

Some of the materials' cost is affected by where the materials are sourced. For example, lime and black plastic paper prices vary depending on where they are procured from (CRS, 2020). For instance, lime which is sold at K7,500 ($10), was mentioned to be one of the resources that can be challenging for other households to acquire.

4.4. Organisation of settlements

Sources: Mwathunga (2014), UN-Habitat (s.d.)

A. The importance of space

According to Mwathunga (2014), spaces in Malawi may have multiple significance, meaning and lived experiences: economic, inheritance, sacred, belonging, and environmental among others. As stated by this author, space whether urban or rural is perceived to have a sacred meaning (e.g. graveyards). He also says that space in Malawi is significant because it gives people a sense of belonging and that it is a belonging. He continues stating that space is perceived as provider for children needs (for next generations) and provider for survival. In fact, this aspect of survival is important, as space is understood as a source of livelihood as well as investment for instance in urban areas. Finally, Mwathunga says that the importance of land to economic development and social welfare, among the local farmers but not only, is unquestionable for it has been used from time immemorial to promote economic growth and human development.

Land usage is generally competitive, and due to the importance of space, relocating away from endangered locations and move to a safe residential location is not always a viable or desirable alternative for communities that have rooted their agriculture production in origin area and would imply availability of land in the receiving area (UN-Habitat, s.d.). .

Nucleated settlement pattern in Mpanga, Mchinji District. © Bing

Disperse settlement pattern in Karonga District. © Bing

Lineal settlement patter along roads or paths in Karonga District. © Bing

B. Settlement and house location patterns

Settlement patterns

In most rural and peri-urban areas there is no settlement plan that is followed when constructing shelters in the communities. The trend of settlement is influenced by peoples' occupations and main activities that are taking place in a particular area. Thus, depending on the area of the country, the types of settlement will vary according to the existing activities and culture.

The most common settlement patterns are nucleated, dispersed and linear along a road or path.

Nucleated settlement pattern occurs in places such as trading centres like markets, where people settle to do businesses. Others settle in such pattern as a clan, where they are culturally encouraged to build shelters at the same place as initiated by their ancestors.

Dispersed and isolated compounds settlement pattern result of families who settle at their farmland or close to grazing land for livestock, but also according to cultural practices.

Linear pattern along a road or path occurs usually for easy access to transportation facilities, but it is also a common pattern in some areas for cultural reasons.

Sadzu village near Salima. Nucleated pattern with separate compounds where constructions do not follow a common location or orientation pattern. © Mike Polela

Houses' location and orientation patterns

In most areas, each family choses the direction that their houses should face or the position of the structures on their plot according to their own preferences.

Orientation of houses on a compound can be affected by the climatic conditions of the area, by the position of the road or neighbouring houses or by the other structures existing in the compound.

In places such as Ndamela (Nsanje District), most houses are built not to face the direction of strong wind to avoid being blown away, and most structures are also built on higher land to avoid impacts of flooding (CRS).

4.5. Conditions of use of housing

Sources: Culture Grams (2018), Government of Malawi (2016a), Huang (2017), Manda (2013), National Statistical Office (2019), Twingi (s.d. a.), UN-Habitat (2020b)

A. Rural areas

Homestead or compound

A homestead or compound is a collection of constructions and spaces belonging to a single or extended family as well as the courtyard uniting all the structures (Twingi, s.d. a). In most rural areas extended families live together in a compound of several dwellings, and when the family has fields, they are usually located near the compound (Culture Grams, 2018).

Courtyard

The cour is the heart of the family's life, where many activities take place, and can last for many generations, while the constructions built on it are usually meant to serve for less time (Huang, 2017). The space inside the compound is well kept and tidy and children are often assigned the task of sweeping the area around the houses each morning (Culture Grams, 2018). Many daily activities, such as cooking, usually occur in the courtyard.

Homesteads are often defined by nature: trees, hedges or fields but also some plots have fences which are constructed with wood or bamboo poles as vertical supports and covered with bamboo, reed or thatch (Huang, 2017).

Dwellings

According to Culture Grams (2018), in a compound there can be several dwellings when it is the home of an extended family. Usually, each nuclear family occupies a dwelling. If there are two rooms inside a construction, the parents sleep in one room while the children share the other room; otherwise, all family members sleep in the same room. Doorways between rooms are usually fabric rather than doors (Culture Grams, 2018).

Many dwellings have a *khonde* or veranda. Verandas and porches are very common. These covered areas have no side walls and are often elevated off the ground. The height and depth of verandas vary greatly. There are houses where verandas cover all four sides of the construction. In other cases, they only cover the side of the main door. Porches are more often situated in the front façade and are supported by masonry columns instead of timber poles, which are more common in verandas (Twingi, s.d. a).

Gowelo

In preparation for manhood, young boys may live in a structure, called a *gowelo*, separate from the rest of the family (Culture Grams, 2018).

Kitchens

A compound also includes a kitchen. Kitchens are a self standing structures in the homestead. They vary greatly in size, shape (round, square, rectangular) and enclosure. Some level of protection is needed from the rain and wind (Twingi, s.d. a).

Women often cook meals over a fire, either in these small covered kitchens or over an open fire with three stones supporting a pot.

Latrines and bathrooms

Compounds may include a latrine and a bathing hut. Latrines and bathrooms are small, self- enclosed structures placed at the edge of a homestead (Twingi, s.d. a).

Farm constructions

Nkhokwe or granaries are structures for storing grain, often maize. They vary in size and materials used in construction. Granaries are commonly round and raised off the ground and are less common nowadays, as many families prefer to

Different constructions in a village. CC- Pixabay

Bamboo, grass or reed fences are sometimes built to reduce the speed of wind and to delimitate plots. House in Lifidzi, Salima. © Jon Twingi

Main dwelling wirh four sides veranda in a compound in Kakhome, Dedza. © Jon Twingi

Kitchen with the upper parts of the walls open for improved ventilation. Nkhombe, Kasungu. © Jon Twingi

store grain inside dwellings for security reasons. When they exist, granaries are circular baskets which rest on a base and often have a thatched roof. The basket is constructed on the ground and lifted onto the base. Due to what it constructed with, the weave pattern varies greatly. A thatch roof on a wood frame is quite common. There are granaries without a roof since thatch is difficult to obtain in some areas. Many granaries are constructed using strips of bamboo. Stips are weaved around vertical members. The vertical bamboo strips are 2 or 3 placed next to each other (Twingi, s.d. a).

Pigeon and chicken coops are common structures on a homestead in some areas. They are a small, weaved structure which is raised off the ground. Chicken coops vary greatly in size and are raised off the ground, commonly at a tall height. (Twingi, s.d. a).

Goat pens are small structures constructed to shelter goats. The supports are large to handle the heavy load (Twingi, s.d. a).

Latrine in Chome, Rumphi. © Jon Twingi

Bathroom and latrine in Nqhondowe, Kasungu. © Jon Twingi

Granary and pigeon coop in Bwanje, Ntcheu. © Jon Twingi

B. Urban areas

Informal settlements

Malawi has a very high increase in urbanisation rate with 4.19% in 2018 and 17.4% of urban population (National Statistical Office, 2019). The rapid urbanization has led to a pressing housing demand exceeding the rate of new housing construction; as a result, 80% of the housing demand is met through informal housing, resulting in insecure tenure, poor quality of housing and overcrowding (UN-Habitat, 2020b).

Informal settlement in Malawi's four cities (Lilongwe, Blantyre, Mzuzu and Zomba) range between 60 and 75% (UN-Habitat, 2020b). These slum settlements are characterised by poor livelihood opportunities, overcrowding and deficient housing conditions, faulty basic amenities and social services including drinking water, sanitation, health care, and education (Government of Malawi, 2016a).

As an example, in low income urban areas some plots are over developed and may accommodate up to 20 households (Manda, 2013).

Different styles of housing

Culture Grams (2018) stated that an average urban home has one to two rooms and is constructed of red bricks or mud bricks. Roofs are usually metal sheeting. The bathroom (either a pit latrine or one with plumbing) is generally located in a separate structure a short distance from the house. Urban homes generally have access to electricity.

Urban styles of housing vary considerably (Culture Grams, 2018):

- Some families live in a compound like in rural areas, with different dwellings and different constructions serving different purposes and with courtyards.
- Other families live in single structures generally with different rooms inside. This is the case of wealthy families and also of some squatter areas.

C. Sleeping rooms

Sleeping rooms

There are 3,984;981 households in Malawi. The share of households per number of sleeping rooms was as follows in 2018 (National Statistical Office, 2019):

- 46.3% had 1 sleeping room,
- 38.6% had 2 sleeping rooms,
- 12.3% had 3 sleeping rooms,
- 2.3% had 4 sleeping rooms,
- 0.5% had 5 sleeping rooms or more.

View of a populated area near Blantyre. CC- Carmichael C.

D. Furniture, appliances and decoration

Furniture and appliances

Generally, households in Malawi do not have a great variety of furniture and appliances. As reported by Culture Grams (2018), homes are furnished according to a family's income. Urban families usually have mattresses while rural families often sleep on *mphasa* (bamboo mats), *nkeka* (palm-leaf mats), or grass mats.

The 2018 Population and Housing Census (National Statistical Office, 2019) collected information on household appliances and furniture:

- 92.2% had a mat used for sleeping,
- 84.8% of households had torch or lamp,
- 38.6% had a table or chairs,
- 32.2% had a bed used for sleeping,
- 31.4% had mattress for sleeping on,
- 17.1% had a solar panel,
- 14.9% had iron used to iron out clothes,
- 5.6% had a refrigerator and
- 4.6% of the households had a cooker or gas cooker.

Decoration

The interior of rural homes may be decorated with animal-skin rugs, *mphasa*, or *nkeka,* while urban homes may have paintings, framed photos, and fresh or artificial flowers (Culture Grams, 2018).

Finishings

The exteriors of homes are usually whitewashed, coated with earth based plaster, sometimes painted or left untreated. The wealthy may paint their homes in a variety of colors. Homes made of adobe bricks are coated with earth mortar to prevent deterioration and give the home a fresh appearance. Designs may be made with different colors of earth (Culture Grams, 2018).

Some compounds have several buildings, some of which are separate sleeping rooms, including *gowelo* or rooms for young boys. Bushiri, Salima. © Jon Twingi

Wash stand and plate drying rack as safer hygiene practices. © Jamie Richardson

Rural area near Mount Mulanje in Mulanje District (Southern Region). © Jon Twingi

4.6. Local housing types and local affordable or self-built housing

Sources: Bremner (2009), Culture Grams (2018), Huang (2017), Kloukinas et al. (2019a), Malawi, Ministry of Lands, Housing and Urban Development (2015), Mpanga (s.d.), National Statistical Office (2017, 2019), Ngoma & Sassu (2004), Novelli et al. (2019), Tara (2014), Twingi (s.d. a), UN-Habitat (s.d., 2010, 2020a)

A. Overview on past models of construction

Past models differ from contemporary vernacular housing

It is necessary to make the difference among past models and vernacular housing. Past models of architecture are not anymore built or used even if they may have left some influences in present models, while contemporary vernacular architecture is alive and is part of the living practices of many people.

Some past models: most buildings were not designed to last

In the past, sedentary population usually lived in buildings which were not intended to last indefinitely (Huang, 2017). Many times, what remained was the place, the site of the plot. As stated by Huang (2017), the courtyard as the hearth of the family could last for many generations, but the cases intended for individuals were only meant to serve for a certain stage of life or for one generation. In the social and cultural plans, family structures and the addition of children and in-laws required a great deal of adaptability in house construction (Huang, 2017).

Apart from this limited durability of sedentary housing and the need of adaptability, Huang (2017) explains that whenever the soil used for farming was not particularly good, nutrient depletion gradually required whole villages to sometimes migrate to clear new land, and so buildings were optimally designed and built to serve this conscious temporality.

Hereafter are presented only some known past models of construction that have disappeared now, but there are certainly others.

Wattle and daub walls with earth flat roofs: a common model was made of wattle and daub walls (timber frames and earth fill) and flat roofs made of earth (Huang, 2017). The roofs required repair or even full replacement after every rainy season according to Huang (2017).

Conical huts with continuous thatch cover for walls and roofs: there was another common building model consisting of conical structures with continuous thatch cover from walls to roof (Bremner, 2009). According to Bremner (2009), this type of architecture was present at least in the Shire River valley and surrounding highlands circa 1865 as reported in the Memoirs of Bishop Mackenzie (Cambridge, 1865) who was part of the UMCA (Universities' Mission to Central Africa) mission station at Magomero (southern Malawi).

Past and present models

Some models have persisted until our days. For example wattle and daub walls with thatched roofs are a contemporary building model in Malawi and was also an existing model in the past (Huang, 2017). Round shape buildings with conical roofs were very common and they continue to exist but are not very used anymore apart from in kitchens or latrines (UN-Habitat, s.d.).

Influence of colonisation in shapes and materials

Round shape with conical roof has been mostly replaced by square/rectangular shapes, as a result of British colonial influence (UN-Habitat, s.d.). Bremner (2009) reported that a chronicler called Rowley, part of the mission station at Magomero circa 1865, pointed out that the orthogonal plans of the mission buildings were starting to have an influence over local inhabitants, who had started swifting from circular to regular plans in their houses.

British colonialism also introduced in Malawi the use of fired red bricks as main structure for walls masonry, but also regular and paced windows and doors, concrete or burnt bricks lintels and high pitch roofs covered with corrugated iron sheets (UN-Habitat, s.d.).

The huts with their conical forms were typical of domestic dwellings in the Shire River valley and highlands circa 1865. The incomplete church of St. Paul in the mission station at Magomero (southern Malawi) is shown far right. CC- Memoirs of Bishop Mackenzie

The orthogonal plans of the British colonial buildings had an influence over local inhabitants, who started swifting from circular to regular plans in their houses Watercolor sketch of Chibisas village. CC- Charles Mellor

British colonialism also introduced in Malawi the use of fired red bricks, regular and paced windows and doors, concrete or burnt bricks lintels and roofs covered with corrugated iron sheets Mission in building in Blantyre. CC- Carmichael C.

Mandala house in Blantyre. CC- butforthesky.com

B. Official classification of housing units

In Malawi, the Population and Housing Census (National Statistical Office, 2019) classifies a housing unit as traditional, semi-permanent or permanent depending on the materials used for its construction, but it has not been found in the Census the actual characteristics of these three types of housing units. The definition varies depending on authors:

Traditional: according to Kloukinas et al. (2019a), a traditional house has rammed earth, wattle and daub or timber walls and thatched roofs. UN-Habitat (s.d.) and Mpanga (s.d.) widen the description to any house built with raw earth, including adobe.

Semi-permanent: UN-Habitat (s.d.) describes a semi-permanent house as one that has generally been built using modern and partial lasting materials, but Kloukinas et al. (2019a) say that a house made of unburnt clay bricks and thatched roofs would be semi-permanent.

Permanent: Mpanga (s.d.) says that permanent structures are made with concrete, stone, or burnt brick walls and iron sheet, concrete or asbestos roofs. Other authors give less inclusive definitions. For example Kloukinas et al. (2019a) say it is made of burnt clay brick and iron sheet roofs.

In 2018, there were 4,805,431 housing units enumerated in Malawi. Of these housing units, 41.1% were permanent, 23.0% were semi-permanent and 35.9% were traditional (National Statistical Office, 2019).

Type of Housing Units	Malawi		Northern Region		Central Region		Southern Region	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Housing Units	**4,805,431**	**100.0**	**565,331**	**100.0**	**2,098,353**	**100.0**	**2,141,747**	**100.0**
Permanent	1,974,613	41.1	304,588	53.9	704,277	33.6	965,748	45.1
Semi-permanent	1,107,447	23.0	148,691	26.3	463,829	22.1	494,927	23.1
Traditional	1,723,371	35.9	112,052	19.8	930,247	44.3	681,072	31.8

Types of housing units in 2018. © National Statistical Office (2019)

There are many intermediate combinations of materials and it seems difficult to define houses following the precedent classification. In any case, there is a clear evolution regarding the shares of the different types of housing units. According to the National Statistical Office (2017 and 2019), in 2010, 42% of the housing units were traditional, while in 2018 the share had dropped to 36%. At the same time semi-permanent houses had remained more or less the same in terms of share, from 27% in 2010 to 26% in 2018. Finally, permanent housing units have increased in share from 31% in 2010 to 41% in 2018.

In this document, we will make a different classification: vernacular, precarious and globalised housing. There will also be a small introduction on history of constructions in Malawi.

Background characteristics	Permanent			Semi-permanent			Traditional		
	2010	2013	2016	2010	2013	2016	2010	2013	2016
Malawi	30.9	35.8	32.6	26.9	28.4	35.3	42.2	35.8	32.1
Place of residence									
Urban	49.9	54.9	60.7	35.4	34.9	32.7	14.7	10.3	6.6
Rural	23.0	28.4	22.4	23.4	25.9	36.2	53.6	45.7	41.4

%age distribution of dwelling units by type of construction materials in 2010, 2013 and 2016. © National Statistical Office (2017)

This is a traditional house according to the official classification of housing units (Simwaka, Nkhotakota). © Jon Twingi

These two houses would be semi-permanent according to different authors as they are built with a mix of materials. The one on top has burnt bricks and thatched roof (Kachopatsonga, Nkhata Bay- © Jon Twingi). The other one has adobe brick walls and metallic roof (Lilongwe- © Urbanopolista)

This is a permanent house according to the official classification of housing units (Chisutu, Mulanje). © Jon Twingi

C. Vernacular housing

In Malawi, contemporary vernacular housing presents a great variety in terms of techniques. Vernacular housing has been affected by diverse influences and new knowledge in building techniques in different degrees and is thus in continuous evolution.

Types of plans

Circular plan constructions: the circular plan is minoritary in Malawi. The vernacular round shape that was suitable to fight strong winds was mostly given up to the orthogonal shapes that required proper orientation to fight the strong winds (UN-Habitat, s.d.) and earthquakes.

Orthogonal plan constructions: the orthogonal plan varies from square to rectangular and is found everywhere in Malawi. It is the most used type these days. The typical size is around 6m x 4m on plan (about 45 per cent of housing in Malawi is in this form), limited by the load-bearing capacity of the roof timbers, with a height of about 2.4 metres (UN-Habitat, 2010).

Foundations and bases

Raised earth platform: very often, particularly in rural areas, the ground is raised to about 30 cm all round the building forming a veranda in order to prevent the walls from surface or running water. In such case, there might be no foundation dug into the ground and the lines of the walls would be marked on the raised levelled ground (Ngoma & Sassu, 2004). There might also be a masonry foundation for masonry walls or timber poles embedded onto the ground for verandas and timber frame wall structures.

Timber poles: in buildings where the walls structures are made with timber frames, the vertical poles are embedded onto the ground in holes of about 30 cm deep as explained in the next point about wattle and daub walls (Ngoma & Sassu, 2004).

Masonry base: in buildings where there is no foundation dug into the ground, after levelling the ground, an adobe, stone or burnt brick wall usually with earth mortar about 40 cm thick is built along the wall perimeter from ground level to a height of about 40 cm (Ngoma & Sassu, 2004).

Masonry foundation: when a foundation exists in masonry buildings, the ground is dug all along the lines of the walls and a masonry foundation is built using stone, burnt bricks (with earth or cement based mortar) or adobe bricks (with earth mortar).

Walls

Wattle and daub or earth on timber frame walls (*yomata*): the original *yomata* house plan was round but the rectangular type is the most common today (Ngoma & Sassu, 2004). In both cases, the materials used are wooden poles, bamboo, earth, grass and natural fibre in various degrees and the tools used are axe, hoe and buckets (Ngoma & Sassu, 2004). These buildings have usually a single storey and are found in rural areas.

The construction procedure regarding foundation and walls is as follows: timber poles of up to 10 cm diameter are cut to 2.5 m length; holes of 30 cm depth are dug in the ground to receive the poles; poles are then placed in the holes but not firmly back filled; horizontal members of about 2.5 cm are tied to the vertical poles at 30 cm centres to provide continuity matrix of the wall; and the vertical poles are firmly embedded into the ground ensuring that the poles are vertical; the earth mortar is now plastered on both sides of the pole walls matrix (Ngoma & Sassu, 2004). The content of the plaster is wet earth, sand, animal dung and straw (Kloukinas et al., 2019a). The vertical poles are sometimes treated with local (e.g. burning the poles...) or industrial methods (e.g. insecticides, used oil...) to fight against moisture or termites. Wooden poles or bamboos in different sizes depending on availability are used for bracing (UN-Habitat, s.d.).

Round and rectangular plan constructions built on raised earth platforms in Juma, Dowa District. © Jon Twingi

House with veranda built on a raised platform with wattle and daub walls and thatched hip roof. Mwamwiyo, Karonga. © Jon Twingi

House built with on a raised platform with wattle and daub walls and thatched gable roof. Mkalawa, Rumphi. © Jon Twingi

House built with timber or bamboo framework vegetal fibres in walls (reeds, bamboo) and roof (thatch). © Jon Twingi

Timber frame and walls of natural fibres walls (grass, reed...): the timber or bamboo structures of these houses are built in a very similar way from those of *yomata* houses.

The difference comes in the walls closing is made as in this case the walls are finished with natural fibres such as grass and reed without earth mortar. These fibres are placed vertically and are tied by some three rows of timber, bamboo or bunches of reed placed horizontally in the low, mid and top of the wall.

Rammed earth walls (*mdindo*): according to Ngoma & Sassu (2004), the material used is earth with not many clay, which is prepared digging a pit and pouring water in it overnight so the soil gets wet, and as the moisture of the soil is critical remixing is done from time to time. The soil is then moved to the wooden formwork which is already placed in the proper place at the construction site and it is rammed in layers in the formwork ensuring that a proper compacting effort has been achieved before removing the mould (Ngoma & Sassu, 2004).

These walls which are about 26 cm thick are usually built by a master builder who had learnt the job from another master builder as he helped with bringing the soil, and are constructed using a hoe, buckets, a mould, a tamping wooden piece, and a scraper for removing soil from the mould (Ngoma & Sassu, 2004).

Adobe or sun-dried bricks masonry walls (*zidina*): these load bearing single-skin masonry walls are constructed by locally trained builders who use sun-dried earth blocks of different sizes with earth mortar (Kloukinas et al., 2019a; Ngoma & Sassu, 2004). Ngoma and Sassu report that the wall thickness depends on the size of blocks used beginning from about 20 cm thickness and the earth mortar to join the blocks usually has a thickness of 1 cm to 1.5 cm. Finally, Ngoma & Sassu (2004) describe that at the roofing level of the wall, a wall plate is introduced which is generally of timber poles.

Unreinforced burnt bricks masonry: these walls are present in the entire country and have different qualities depending on the characteristics of bricks, the type and quality of mortar (earth or cement), the thickness of the walls, the presence or lack of lintels or the connections between adjacent walls.

Single-skin walls are the most common, but there are also double skin walls. The sizes of bricks vary; low quality walls include those without lintels and high quality ones include those with timber or concrete lintels in the openings (Kloukinas et al., 2019a). In a research by Novelli et al. (2019) in the urban areas of Salima and Balaka and in the informal settlements of the rural villages Lifidzi and Golomoti mud mortar was identified for 76% of the inspected buildings; 55% of the inspected houses were built with single-skin walls with thickness varying from 100 mm to 160 mm and 45%. had double-skin walls and thickness varying from 210 mm to 260 mm.

Openings

Often, houses have few windows, usually with a small size or no windows at all because of security issues. Doors and windows are usually manufactured with timber, but also sometimes they can be made with bamboo or reed in households with little resources. Also, some openings are built leaving gaps in the masonry creating brick or adobe lattices. In cities, there are many metallic windows and sometimes doors. The openings often have timber lintels which are usually not used efficiently so that sagging is very common (Ngoma & Sassu, 2004). Interior spaces are often separed using curtains, but there are also places where timber walls appear. Glazed windows are present in the homes of the wealthiest families.

Roofs

Houses in Malawi predominantly have sloping roofs of different types. The most used materials for covering are thatch and light metal sheets. Regarding the structure and the form of the roof, the following types are the most prevalent:

House under construction with rammed earth walls. Chimombo, Ttchisi. © Jon Twingi

House with four sides veranda built on a raised earth platform with adobe walls and thatched hip roof. Chipile, Mangochi. © Jon Twingi

House built on a raised stone and earth platform with burnt brick walls and thatched hip roof. Sifukwe, Karonga. © Jon Twingi

House with veranda built on a raised platform with burnt brick walls and hipped roof covered with thatch. Mariata, Nkhata Bay. © Jon Twingi

Conical roofs: a central pole of about 15 cm diameter is placed at the centre and embedded 30 cm into the ground to receive sloping members (bamboo or timber) of about 7 cm diameter acting as rafters spanning to outer round perimeter walls; these sloping members receive horizontal members of 3 cm diameter acting as purlins placed at 30 cm centres top and bottom and tied by bark strings; the pitch is generally not less than 20 degrees; the grass thickness varies but is about 10 cm; the grass is sometimes pressed onto the timber skeleton by three rows of fine timber or bamboo members placed at the eaves level, mid-way and top tied by bark strings (Ngoma & Sassu, 2004).

Gable roofs: the ridge beam (usually a timber pole) lays on the gable walls and on two king posts which are supported by two beams supported by the longitudinal walls and placed at more or less 1/4 points from the ends. There are timber wall plates or rough timber poles laying on the longitudinal walls. The rafters lay on the ridge beam and on these wall plates and a series of timber purlins which support the cover (generally poles) runs over the gable walls and are supported by rafters. According to these authors, truss roof construction is also used. The most common cover types for gable roofs are either thatch or iron sheets (Kloukinas et al., 2019a).

The most common cover types for gable roofs are either thatch or iron sheets (Kloukinas et al., 2019a). Sometimes, once the thatch has been placed, small sized timber poles are split and placed above grass and tied to poles below grass so that grass does not move out of place (Ngoma & Sassu, 2004).

Many thatched roofs have a plastic sheet membrane between the framework and the cover.i

Hipped roofs: the four walls have timber wall plates or rough timber poles to receive the loads coming from the rafters in this four slopes roof. A ridge beam (usually a timber pole) is supported by two king posts which are supported themselves by timber pole beams spanning across the longitudinal walls; the two beams are placed at more or less 1/3 points from the ends (Ngoma & Sassu, 2004). Four hip rafters join the ridge pole to the walls. The cover is supported by timber purlins (generally poles) supported by rafters and which run over the four hip rafters in the angles. The most common cover for hipped roofs is made of thatch, but there are also iron sheets covers.

As said for gable roofs, sometimes, once the thatch has been placed, small sized timber poles are split and placed above grass and tied to poles below grass so that thatch does not move out of place (Ngoma & Sassu, 2004).

Also, many thatched hipped roofs have a plastic sheet membrane between the framework and the cover.i

Ceilings: flat ceilings exist in some houses, especially in urban areas (Tara, 2014). They can be made of reeds or timber panels.

Khonde or veranda

Poles of about 15 cm diameter that are spaced about 60 cm apart support eaves projections placed about 70 cm from the wall forming a veranda or *khonde* usually raised about 15 cm above ground level to protect the walls from surface or rain water (Ngoma & Sassu, 2004).

Finishings

Earth plastering: earth plastering or smearing is very common and is made of earth and water, and sometimes it has additives such as organic matter or lime.

Earth paintings: decorations with paintings on the side of walls are quite common, and the colours are usually from the local soils (Twingi, s.d. a).

Earth smear floor finish: most rural homes have earth floors (Tara, 2014).

House built on a raised earthen platform with thatched gable roof and a plastering including colours for decoration and protection. Bisani, Nkhata Bay. © Jon Twingi

House with burnt brick walls, thatched gable roof protected from the winds with timber elements on it and a plaster to protect the main façade from the driven rain. CC- May N.

House built on a raised platform with a four sides veranda and a thatched hip roof and with its façades protected by a plastering and painted. Gama, Mchinji. © Jon Twingi .

House with veranda built on a raised platform with burnt brick walls and gable roof covered with light metal sheets. Gawanani, Zomba. © Jon Twingi

B. Precarious housing

Precarious housing characterises houses or shelters built by low-income families or by those who, without a land property title, prefer to limit their investment by choosing light structures that are easy to dismantle or repair. In Malawi, makeshift squatter areas are places where homes are built from salvaged materials and located very close to one another and where drainage is often inadequate, resulting in unsafe and unsanitary conditions (Culture Grams, 2018).

As an example, the overcrowded informal settlement of Mchesi in Lilongwe, has makeshift structures, woefully inadequate sanitation systems, scarce and insufficient water supply, no security of tenure, few opportunities for income generation, lack of personal security and also several health problems and risks (Mpanga, s.d.), often linked to housing and settling conditions.

Another example is reported by UN-Habitat (2020a) in Karonga, where informal settlements are mainly located on customary land and accommodate a large proportion of the city's population mostly in poor quality houses. Many informal settlements have expanded onto the flood plains along the river, the lakeshore or in flood control drainage channels, and thus their inhabitants have higher risk exposure (UN-Habitat, 2020a).

Thanks to the implementation of some programmes and actions by the government in conjunction with multilateral agencies, the proportion of people living in slums has declined from nearly 90% in 2005 to an estimated 64.3% by 2015. This is the result of the strategies to upgrade and improve the conditions of life in slums, together with the low cost government housing initiatives (Malawi, Ministry of Lands, Housing and Urban Development, 2015).

Precarious housing in Lilongwe. © Rethink Earth

Houses with burnt brick walls, Reinforced Concrete beams and window sills, CGI sheets roof in Chisusu, Nzimba. © Jon Twingi

View of Blantyre, a city with globalised housing models. CC- Nchenga, N.

C. Globalised housing

These types of buildings are not affordable for the majority of the population, but they exist for housing purposes and are therefore briefly exposed hereafter:

Unreinforced concrete blocks: houses built with this techniques are rare, their location is mainly in urban areas, and usually have one storey and rectangular shape (Kloukinas et al., 2019a). They are built with vertical load bearing single skin walls made of unreinforced concrete blocks of various sizes with cement mortar; the roof's framework is built with timber trusses and the roof is covered either with thatch, corrugated light metal sheets or even tiles (Kloukinas et al., 2019a).

Confined masonry: used in medium-high standard houses and found exclusively in urban areas with a usual rise of two to three storeys and rectangular plan (Kloukinas et al., 2019a). These buildings have load bearing vertical fired brick walls confined in Reinforced Concrete columns and beams, and their roof is built with a concrete slab or timber truss with corrugated light metal sheet or tiles (Kloukinas et al., 2019a).

Reinforced concrete with masonry infill walls: it appears in medium to high standard residential constructions of one to five storeys and rectangular shape (Kloukinas et al., 2019a). The structure is made of vertical load bearing Reinforced Concrete frames with infill of fired bricks or concrete blocks and a roof built with concrete slab or timber trusses with corrugated light metal sheet or tiles (Kloukinas et al., 2019a).

Unreinforced or reinforced stabilised soil blocks (SSB) walls: single storey and rectangular shape building usually found in cities and built with vertical load bearing single-skin walls made of compacted blocks of earth mixed with a stabilizer (cement or lime) and mortar made of stabilizer and earth (Kloukinas et al., 2019a). It can also have vertical load bearing RC frames with SSB infill. The roof is usually built with timber trusses and CGI sheets or tiles (Kloukinas et al., 2019a).

5. Learning from local building cultures

5.1. Hazard-resistant practices

Sources: Bureau TNM (2016), CRS (2018, 2020), Government of Malawi (2010, 2019), Kloukinas et al. (2019a), Kloukinas et al. (2019b), Moles et al. (2017), Novelli (2018), Sassu (2011), Shelter Cluster Malawi (2015), Trogrlić et al. (2018), UN-Habitat (s.d.), World Bank Group, et al. (2019)

A. Integral approach

Thinking about hazards, there is a need to take into account all the hazards that may affect a given area, and not only the one that can be seen as prevailing.

The choice of the construction site is crucial for safety. Whenever it is possible to choose there are several important aspects that must be taken into consideration according to the Safer House Construction Guidelines of Malawi (Bureau TNM, 2016). One of the most important issues described is to take into consideration local knowledge, historical data, and district's advise on whether the area is prone to a specific risk. Also, when selecting the site for a new construction it is important to consider that the soil type influences the building's performance. It is crucial to build on relatively stiff and compact soil so the building does not move.

Also, after a disaster, rebuilding efforts increase the rate of resource extraction for building materials. This degrades the environment and increases risk with greater erosion, deforestation, landslides and floods. This may deprive communities of essential livelihood resources and put people, infrastructure, and ecosystems at greater risk of future disasters (WWF, 2018).

Finally, collective buildings such as evacuation centres or schools which are used by communities during and after disasters should be easily accessible for all, located in a safe place (e.g. above known flood levels, far from instable slopes...), and be resistant to different hazards (Shelter Cluster Malawi, 2015).

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

B. Floods

Settlement and preparedness practices

- Most communities are used to build at a safe distance from watercourses, which is the best option to prevent damages due to flooding. In places such as Ndamela (Nsanje District) most structures are also built on higher land to avoid impacts of flooding (CRS).
- In some villages, when the water levels are increasing, people living in the lowlands, close to the river banks position a stick in the river banks and monitor the speed at which waters are increasing. Based on this observation, the decision on possible evacuation will be made (Trogrlić et al., 2018).
- Communities in the Lower Shire Valley build physical barriers by filling empty sacks with sand and place them next to the river before floods (Trogrlić et al., 2018).
- Some families in the Lower Shire Valley report that they store food in their second homes in the uplands as a strategy to reduce the potential impact of flooding (Trogrlić et al., 2018).

Treatment of the surroundings of the building

- Within a settlement, adequate and well-maintained drainage systems are usual. Blocked drains contribute to floods and damage housing (Shelter Cluster Malawi, 2015). Some communities have a good understanding of this issue and so dig and maintain drains. For example, communities in the Lower Shire Valley make gullies in the ground to divert the flood waters flow (Trogrlić et al., 2018).
- Drainage channels are dug to take surface water away from the building. Sloping the surface around the house to evacuate water from the walls is also a good practice.

To find out more

- Guidelines for Safer House Construction: Technical Manual
  -> Government of Malawi (2010)
- Repair and Retrofit Handbook for dwellings in Malawi
  -> Malawi Shelter Cluster (2015)
- Indigenous knowledge and early warning systems in the Lower Shire Valley in Malawi
  -> Trogrlić et al. (2018)

Houses constructed using adobe bricks, render and earth mortar like this one (Chisoka, Rumphi District) responded well to the important floods in 2015 (CRS, 2020) as the design developed over centuries provides protection from the elements. Other than some minor repairs, some of these houses were in good condition and allowed the families to return to their homes once the floods had subsided. © Jon Twingi

Stone foundation and plinth (Chimwendo, Karonga) protecting the walls from humidity and floods. © Jon Twingi.

Plastic membrane protecting the wall from humidity in Masako, Dowa (bottom). © Jon Twingi

- Vegetation cover around the houses protect them from strong winds and erosion, but also from floods effects thanks to the roots system. The roots promote the penetration of water into the soil. Low vegetation slows down the speed of water flow and also helps reduce soil erosion. On the other hand, low vegetation too close to the walls will keep humidity near the buildings and lead to rising damp problems. Trees can also be used as food suppliers, as building materials or for firewood. Some communities organise and strengthen river banks by planting trees and grass (Trogrlić et al., 2018).

Raised platforms and raised constructions

- In flood prone areas, many houses are constructed on raised earth or earth and stone platforms which help protect the core structure from erosion. This is accomplished by raising up an earthen mound above the average annual flood level. The edges of the earthen platform work as a sacrificial mass in case of floods. This solution is very effective and it can be done at minor cost with earth from the site. Regular maintenance is required to ensure its effectiveness.
- Some families protect the ends of the raised earthen mound with fired bricks or stones. The idea is to slow down erosion in the event of a «flash flood» but also to confine the plinth. Also, some families protect these mounds with earth-based plasters.
- A strategy to reduce impacts of flooding in the Lower Shire Valley is building a *sanja* or *nthandala* in homes, a raised platform used to store food and seeds, thus preventing them to be damaged by floods and heavy rains (Trogrlić et al., 2018).
- Elevated granaries which help to protect crops against moisture and floods are common in some areas.
- The impact of floods on livestock and small animals is a challenge for communities, since replacement of animals is very often beyond families financial capacity. In many parts of the country, chicken and goats are kept in raised platforms made out of local materials like wood or bamboo with the goal of ensuring safety during floods (Trogrlić et al., 2018). These are called *kraals* in areas such as the Lower Shire Valley. Animals are protected from floods and moisture, but also from possible predators and steal.
- *Chete* is a local name in the Lower Shire Valley (at least in Nsanje) for raised temporary shelter made out of locally available wood and grass. *Chetes* will be constructed in the flood prone areas, and during the rainy season, families will be residing in these temporary shelters (Trogrlić et al., 2018).

Protection of the wall base and construction details

- Constructions sometimes present deep and water resistant foundations and elevated plinths built using burnt bricks or stones and cement mortar. Water resistant plinths should be built at least above the average level of floods.
- Rising damp (water from the soil) can weaken the base of the walls and floors. Some houses have plastic sheeting or other waterproof materials as a barrier above the foundation or plinth, and less usually a damp proof membrane below the floor as well (Shelter Cluster Malawi, 2015). These barriers are useful to fight against rising damp.
- The roof structure is sometimes borne by an independent timber frame. In case of damage to the walls during floods or earthquakes, the frame can withstand autonomously, hence preserving the roof which is often the most expensive part of the construction. Moreover, the space under the withstanding roof can be used as an emergency shelter.

The earthen mounds are strengthened before the rainy season. The foundations are improved with an extra layer of mud. House in Chaima, Dowa District. © Jon Twingi

Some families protect the ends of the raised earthen mound with fired bricks or stones. House in Mtetera. CC- Firesika.

Raised platforms inside the houses are used to store food and seeds, preventing them to be damaged by floods. House in Chakhutupa, Chitipa. © Jon Twingi

Raised constructions help protect small animals like goats or chicken from floods. These constructions are very common throughout the country. This is an example of raised goat pen at Naming'azi Farm Training Centre. CC- Carmichael C.

C. Storms and strong winds

Settlement and preparedness practices

- Settlement patterns with scattered buildings and vegetation contribute to breaking the wind flow thus reducing its impact on construction. This is a common pattern in the country.
- Maintenance is very important, as when the roof and walls have been maintained, they provide bigger protection.

Treatment of the surroundings of the building

- Tall trees and vegetation, in layers, protect houses from windstorms and driving rain, when placed at a sufficient distance from the house in order not to harm inhabitants or damage the house in case they fall down.
- Screens built from bamboo and grass are made to protect the houses from wind and rain. These screens also delimitate plots.

Building design

- In areas with prevalence of strong winds such as Ndamela (Nsanje District), the shorter elevation of buildings usually faces towards the dominant direction of strong winds to reduce wind pressure on the construction (CRS).
- Round or square compact buildings are more aerodynamic and are stronger against winds, flooding and earthquakes. Many families avoid constructing long rectangular, L-shaped and C-shaped buildings that 'trap' the wind and water and are more problematic in the event of an earthquake.
- Low houses are common as they have better resistance to strong winds.
- Sometimes, the roof of the veranda or porche (*khonde*) is structurally independent from the main roof of the building in order to avoid damage to the main roof during strong windstorms. If the roof of the veranda lifts due to high winds, the damage will not extend to the roof of the main building.
- Hip roofs have a greater resistance to strong winds than one or two-slope roofs as the overall form of the building is more aerodynamic, and the frames are attached directly to the beams that comprise the building walls. The hip roof design can be built using different materials, both local and industrial.
- Hipped roof with large overhangs and veranda also avoids having exposed gable ends and prevents driving rain from damaging the walls. They also reduce the surface area for wind load.
- Some existing good practices are related to the roof pitch, even if not all times the best pitches are observed. A roof pitch of 20° to 30° is good to reduce effects of suction and uplift caused by strong winds (Bureau TNM, 2016).
- For thatched roofs, the ideal slope which is usually observed in local architecture is 35 ° to 45 °, because they do not suffer too much from the wind (fusible effect of thatch roofing in relation to the overpressures and underpressures of iron roofs) but they must drain water quickly to avoid rapid rotting of the grass.

Construction details

- Wooden poles are sometimes built on a masonry base (protection from moisture) and fixed to it through a screw or nail, properly embedded in the vertical joints of the plinth during the construction process. The connection will prevent the uplift of the pole due to the suction force of wind.
- Coatings are very usual, and they help to increase the resistance against flood waters, heavy rains and waterlogging. For walls made of adobe blocks or rammed earth, earth mortar, *dambo* sand or a lime based plaster can be used as there is a risk of long-term damage to earth walls if they cannot properly evacuate humidity, what happens with a cement coating (Shelter Cluster Malawi, 2015).

Trees and vegetation protect houses from windstorms and driving rain. The roots also fight against erosion and they are a source of food, fuel and construction materials when well managed. House in Kabomolo, Chitipa. © Jon Twingi

In some villages, the roof is used as a support for climbing plants. The risk of wrenching as well as partial or total uplift is reduced as the plants fasten together the roof components and attach the roof to the ground through the roots. House in Nsangu, Salima. © Jon Twingi

The roof structure is fastened to the ground with a motorcycle chain, what provides an additional connexion thus preventing the roof from being entirely blown off under wind pressure. House in Nsangu, Salima. © Jon Twingi

The roof of the veranda (*khonde*) is structurally independent from the main roof of the building in order to avoid damage to the main building roof during strong windstorms. Construction in Karonga. © Sonia Molina

- Strong connexions (of the roof elements to each other and of the roof structure to the walls) are a common way to prevent uplift of roofs in case of strong windstorms. Very often, the roof structure is tied to the walls using tie wire or ropes. For this, rafters are tied to the wall through several wrappings of galvanised metal wire, avoiding to wrap the metal wire in correspondence to vertical mortar joints.
- The roof structure is at times fastened to the ground (for example with motorcycle chains), what provides an additional connexion thus preventing the roof from being entirely blown off under wind pressure. The roof structure can slightly move but it is kept in place avoiding wrenching and severe damage (Moles et al., 2017).
- Sometimes, the roof is used as a support for climbing plants and creepers. The risk of wrenching as well as partial or total uplift is reduced as the plants fasten together the roof components thus helping to stabilize the cover, and also, the roof is attached to the ground through the roots of the plants (Moles et al., 2017). On the other hand, these plants might cause rotting of the thatched roof when keeping humidity.
- Longitudinal bamboo or timber pieces are sometimes joined to the roof's structure for better resistance to wind. This joining to the main house structure reduces the risk of roofing being blown away.

The roof structure is tied to the wall through several wrappings of galvanised metal wire, avoiding to wrap the metal wire in correspondence to vertical mortar joints. House under construction in Chakwela, Mangochi. © Jon Twingi

Longitudinal bamboo or timber pieces are sometimes joined to the roof's structure for better resistance to wind. House in Nyemba, Kasungu. © Jon Twingi

Other practices

- Sometimes, heavy objects are placed on top of the roofs in order to avoid uplift. While being a simple practice, it is necessary to take into account that they might be unstable and may fall and cause damage.
- The uplift of roofs is sometimes closely linked to the quality of the openings (doors and windows) and the practices of people concerning these openings in times of high winds (open or closed). Also, constructive management solutions of overpressure / underpressure (eg, ventilation, extraction chimneys, etc.) are in place in some countries.

Bamboo, grass or reed fences are sometimes built to reduce the speed of wind and to delimitate plots. Grass screen in Siyasiya, Zomba. © Jon Twingi

D. Erosion and landslides

Scale of the territory / settlement

- Trees (particularly deep rooting ones), bamboo and other vegetation in slopes prevent from landslides as they improve the soil's stability and so reduce soil's erosion. In case of an insufficient number of trees, consider afforestation strategies in order to prevent soil erosion and reduce wind speed (Bureau TNM, 2016).
- Surface drainage systems exist in the scale of the settlements. They are usually executed with simple means and contribute to the reduction of erosion and landslides by ensuring that water flows are managed and directed away from unstable areas.
- Brick or adobe-making needs soil extraction. When this is done in the immediate vicinity of villages or homesteads this increases soil erosion (Bureau TNM, 2016).
- Stone bunds, anti-erosion devices made up of stones arranged in one or more rows, along contour lines, are a solution to reduce the speed of surface water and promote the penetration of water into the soil. They break the force of runoff water while allowing excess water to pass through in order to avoid water concentrations upstream or cause slower flow of water downstream. Over time, stone-filled slopes may morph into arable terraced farmland.
- Retaining walls are sometimes constructed in zones with important slopes (more than 30°), what is good to reduce the risk of landslide as they enhance the resistance of the slope (Bureau TNM, 2016).

Stone bunds are a solution to reduce the speed of surface water and promote the penetration of water into the soil, thus avoiding erosion. Example of stone bunds built by Khole community in Machinga district. © PCI

Scale of the houses

- Sometimes, drainage channels are dug around houses to take surface water away from the buildings, what reduces erosion and saturation of the soil.
- Some families slope the soil next to the house away from the building in order to better evacuate water (Global Shelter Cluster, 2015) and to protect the base of the wall and the foundations. This can be done through a concrete path when it can be afforded or ramming the surrounding earth.

Riverbanks erosion

- Riverbank stabilisation is achieved through simple means such as siltbags.

Riverbank stabilization with siltbags in Chilanga river in the zone of Kadzuwa village. © PCI

E. Earthquakes

Building design

- Seismic vulnerability cannot be only based on the wall material and not all permanent houses are safer than others (Kloukinas et al., 2019a).
- Compact, symmetric (in the placing and sizing of door and window openings) and regular shaped buildings are common and they are more resistant to earthquakes than irregular shaped buildings (Bureau TNM, 2016). While less and less buildings have a circular plan, constructions with square or rectangular plans (building's length not exceeding 3 times its width) are very common. In a case-study, seismic vulnerability due to irregular building shapes was found to be low, since more than 75% of dwellings were found to be rectangular with acceptable building aspect ratios (Kloukinas et al. 2019a).
- Houses usually are one storey with lightweight roofs, so only small horizontal actions need to be sustained by the load-bearing elements of the structures (Kloukinas et al. 2019a).
- Hipped roofs are a better solution than gable roofs, which have unrestrained masonry gables behaving as unstable vertical cantilevers and can easily be subject to out-of-plane collapse during seismic motion (Bureau TNM, 2016). "From the seismic vulnerability perspective, the Government's subsidy programme to promote the use of corrugated iron roofs, (...) might have caused a negative side effect", as there are more gable roofs (Kloukinas et al., 2019a).
- The area of openings does not exceed 50% of the wall area in traditional houses, providing good resistance to seisms. Moreover, windows or doors are very usually placed with a sufficience separation from eachother and from corners and do not have too big dimensions.
- When verandas exist, it is preferable to have them as a separate element, so that in the event of an earthquake or high winds any movement will not affect the rest of the structure (Government of Malawi, 2010).

Low-rise houses with round and compact forms and symetric and scarce openings and light roofs are good to resist seismic forces. Round house in Kachipeso, Dowa (top). Square house in Muwanga, Chitipa (bottom). © Jon Twingi

Flexible structures, lightweight materials

- Timber, bamboo and reed structures in wattle and daub houses have a good flexibility. They are more seismically resilient and rarely collapse in the event of an earthquake. Even if they collapse, they are less likely to cause loss of lifes as they are light. These dwellings were largely undamaged by 2009 Karonga earthquake (UN-Habitat, s.d.) and during the earthquakes in 1989 in Salima these dwellings sustained limited damage while unreinforced masonry buildings were much more damaged (World Bank Group, et al., 2019).
- Light roofing structures (either CGI sheets roofs or thatched roofs) are good solutions in the event of an earthquake as even if they fall they are less likely to cause damages. On top of that, heavy roofs increase the seismic forces acting on the top of structural walls, increasing considerably the vulnerability of the building and they can kill inhabitants due to their weight.

Construction details

- In order to prevent failure of walls out of plane and also to increase stability of buildings, the use of buttresses is a low-cost solution. These structural elements, not very common in Malawi, are built using fired bricks and cement or mud mortar and are located perpendicular to walls which are vulnerable to fail during an earthquake. In Salima, buttresses are elements built in new houses made of fired bricks and cement mortar (Novelli, 2018).
- In some masonry houses, the walls are well tied up with each other, so the building can act as a box during earthquake vibration.
- In some masonry houses (fired bricks, adobe, rammed earth), there is a timber ring beam at the top of the wall (important to treat against termites). Pine tree or blue gum are recommended. There needs to be a suitable connection as wire tires, steel or timber pegs attached into the masonry at least 60 cm down. When it is the case, this junction between the roof structure and the wall allows the roof structure to provide bracing to the walls and ties the roof down (Government of Malawi, 2010; Novelli, 2018).
- In wealthy houses (fired bricks, CEB, cement blocks) there is usually a concrete ring beam at the top of the wall or at the lintel level (Bureau TNM, 2016).
- Well built wall textures provide bracing and shear resistance (Sassu, 2011).

Light structures are good solutions in the event of an earthquake as even if they fall they are less likely to cause damages. Structure of a wattle and daub house in Mwaluwimba, Karonga. © Jon Twingi

F. Drought

Practices

- Communities in the Lower Shire Valley have different strategies to withstand drought episodes (Trogrlić et al., 2018):

  → They practice conservation agriculture such as mulching, they move the planting season from October to November, they use early maturing and drought tolerant crop varieties (instead of maize, plant long millet, Irish potatoes, goal, sorghum or rice), they use rice fields for growing maize… They also go to marshes or islands (*makungu*) to find areas with residual moisture to cultivate.

  → They store food. They dry sweet potatoes, maize, or cassava and keep pigeon peas for use later at the maize mill.

  → They plant trees along river sides to keep water longer.

  → They dig up temporary shallow wells (up to 8 m deep) to be used for watering crops during short dry spells.
- Water management should be further analysed, either at family or community level.

Food storage is one of the strategies to withstand dry periods. Granaries in Kabudula, Chikwawa (top) and big granary in Kapiri, Mchinji (bottom). © Jon Twingi

G. Fire

Scale of the territory / settlement of the territory / settlement

- To fight against the effects of uncontrolled burning for agricultural purposes in houses, strategies such as a ring without vegetation around houses or settlements are used in some places.

Buildings position

- Building materials such as thatch are flammable, so it is necessary to have special precautions to avoid the impact of fire. For example, most constructions in rural family homesteads are placed separately ones from the others. The position of kitchens is particularly important, moreover when charcoal/wood is used. Distance between buildings also helps reduce damage due to the collapse of neighbouring buildings in case of flood, windstorm, or earthquake (Bureau TNM, 2016).

Distance between buildings is a good strategy to fight against the spread of fires. Most constructions in rural family homesteads are placed separately ones from the others. Homestead in Gausi, Nzimba. © Jon Twingi

- The position of houses in relation to the direction of the prevailing winds is a crucial strategy to fight against fire, and there is a need to deepen knowledge about this practice in Malawi.
- Also, there is a need to study if it is a local practice to place the kitchen in the most separate place from the coming winds.

H. Animals and insects infestation

Practices

- An effective strategy agains termites is maintenance. There is a need of frequently applying a treatment to avoid possible attacks (Bureau TNM, 2016) and of replacing the elements that have been attacked for structural safety.
- When cooking is done inside the buildings, the smoke acts as a treatment of thatch against insect attacks.

Treatments

- In some areas (e.g. in Phalombe District), timber poles are burnt to prevent termites' attacks before being inserted on the ground.
- One of the most effective strategies to respond to the termites' attacks is to use resistant and treated wooden material when possible. When using industrial pesticides, it is important to respect the amount indicated by the different brands (Bureau TNM, 2016).
- Burned and crushed tree pods, charcoal and ashes (Twingi, s.d. a) are used as additives in plastering and are an anti-insect treatment.

Construction details

- In some constructions, the contact surface between the wall and the roof structure is minimised using only some bricks or timber poles to sustain the framework in order to allow for a better visual detection of termites paths and thus a better control of their attacks. There needs to be some further analysis to confirm if this is the actual reason of this practice in the places were it has been found. This practice also allows for a good ventilation of the interior spaces.

Granaries and food conservation

- Granaries are isolated from the ground, not only to protect the food against moisture and water, but also to avoid the bad impacts of small animals and insects.
- Some granaries have metallic barriers in order to impeach rats and other small animals to reach the food.
- Some communities in the Lower Shire Valley used to store food in granaries and or in sacks in the house with a treatment of luckina leaves to avoid weevil bites or ashes working as insecticide. They do not store it anymore, probably because of locusts that destroy the storages (Trogrlić et al., 2018).
- There needs to be further study about other local methods for treatment of wood or bamboo against moisture or termites such as ground preparation practices, ground treatment around buildings, «sacrificial» technique by giving food to termites elsewhere, localization of termite mounds, repellents in the walls, hens, etc.

This granary in M'buka (Kasungu District) has metallic barriers in order to impeach rats and other small animals to reach the food. © Jon Twingi

House in Dzipusile, Ntcheu. This house has a contact surface between the wall and the roof structure which is minimised using only some bricks to sustain the framework. This permits ventilation, but also allows for a better visual detection of termites paths and thus a better control of their attacks. © Jon Twingi

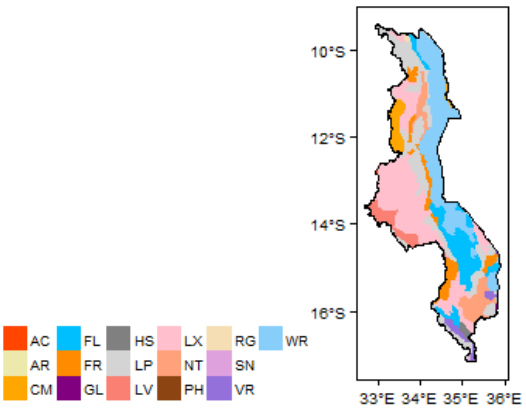
Timber poles are burnt to prevent termites' attacks before being inserted on the ground. Phalombe District. © CADECOM

Verandas and large roof overhangs between the interior earth wall and the exterior avoid the risk that changes in humidity associated with rain will swell the soil under the walls. House in Simwaka, Nkhotakota. © Jon Twingi

I. Black cotton soils

Building on black cotton soils is to be avoided because the change in water content has a big impact of shrinkage and swelling in these soils containing clays highly reactive in contact with water. This fact may cause crackings and even the collapse of buildings standing on these soils. That said, the geographic areas with presence of these soils are generally quite large, so there is usually no choice.

- A good strategy to avoid damages is to avoid any risk of altering the water content of the soil supporting the building. Verandas and large roof overhangs between the interior earth wall and the exterior avoid the risk that changes in humidity associated with rain will swell the soil under the walls. Drainage systems help minimise help evacuate water from the walls bases. The inclination of the ground surrounding the building is also a strategy in order to evacuate water away from the site.
- Constructions with relatively reduced dimensions as well as several constructions disconnected from each other help adapt more easily to the movements of the ground and therefore crack less due to its expansion and retraction. This kind of constructions are very common.
- Constructive solutions like wattle and daub structures have more flexibility and better accept the deformations resulting from ground movements. Even deteriorated, they can keep their functionality without risk to users.
- Trees have an impact on the amount of water in soil and depending on the time of year and soil type may cause the ground to heave or subside. Buildings should be constructed outside of the canopy of any tree (an estimate should be made of the mature tree size) (Government of Malawi, 2010).



Malawi map of soils. We can see that there are vertisols (VR) in Nsanje district in the South of the country, as well as in a small zone in Phalombe district to the South-East. Vertisols are a soil type in which there is a high content of expansive clay minerals, many of them known as montmorillonite, that form deep cracks in drier seasons or years. © Earthwise, BGS

Flexible structures like wattle and daub ones better accept the deformations resulting from ground movements. Also, limited dimensions of constructions help avoid important crackings. Wattle and daub house in Malengamzona, Karonga. © Jon Twingi

5.2. Improvable construction practices and recommendations

Sources: Bureau TNM (2016), CADECOM & CRS (2015), CRS (2015, 2018), Government of Malawi (2010, 2019), Kloukinas et al. (2019a), Novelli (2018), Shelter Cluster Malawi (2015), Tara (2014), Uark (2017), UN-Habitat (s.d.),

The practices presented hereafter are not exhaustive and they only represent a sample of the existing.

A. Settlement, soil, position of constructions

Improvable practices

- Flood control channels constructed to channel flood water become ineffective because of lack of maintenance (i.e. Karonga) (Uark, 2017).
- There is evidence of a lack of knowledge of the scale of risks to which inhabitants expose themselves when settling in areas at risk because of ease of accessing land (Uark, 2017).

Recommendations

- Build at a safe distance from watercourses to prevent damages due to flooding. This is not always possible due to availability and property or use of land, to cultivated lands, and to attachment to a place, and so such communities will live with floods and need to be supported to do so in safely.
- Locate buildings out of the areas at risk of landslide and erosion when possible. When the populations are already settled, constructing retaining walls and reducing the slope are good options (Government of Malawi, 2010).
- It is recommended not to settle on the top nor at the bottom of a hill (Bureau TNM, 2016) where the slope is steeper than 30°, where there are black cotton soils, where there are no drainage systems, where there is no vegetation, where there are no proper retaining walls or soil is in loose conditions.
- The middle of a slope has also conditions for avoidance of risk. It is necessary to leave 1.7m horizontally for every 1m vertically to minimise risk (Government of Malawi, 2010).
- A distance between buildings of 6m in urban areas and 10m in rural areas is recommended to avoid the spread of fire (Government of Malawi, 2010). Buildings constructed at a distance of less than 6-10m from each other should avoid doors and windows facing other constructions.

- Distance from the power line must be taken into consideration, in particular in areas prone to windstorms. ESCOM needs to be consulted for confirmation of the safe distance to be applied (Bureau TNM, 2016).

B. Surroundings of the building, foundation

Improvable practices

- Moisture and stagnant water can become a problem if there is no superficial drainage at the base of the walls.
- Lack of proper foundations make houses easily collapse during floods. Low or no foundations let in flood water into the houses. Flood waters easily wash under shallow foundations and liquify sun-dried bricks and mud mortar.
- Also, when the foundations are poor, it results in settlement and cracking (Kloukinas et al. 2019a).
- An important vulnerability of wattle and daub buildings resides in the shallow foundation (UN-Habitat s.d.). Also, if the wooden poles are in direct contact with the ground they are vulnerable to rising damp and decomposition.

Recommendations

- Earthen platforms or water-proof plinths are very important in constructions built with adobe, rammed earth or fired-bricks with earth mortar (CRS, 2018).
- Foundations must be excavated to a depth to achieve firm sub soil base (CADECOM, CRS, 2015) and should be built with waterproof materials in external and internal walls (CRS, 2018). The exception is in sites with black cotton soils, where other strategies should be followed (see 5.1.I).
- Wooden posts of veranda (particularly blue gum-eucalyptus-) need to be heat treated and buried below ground level if there are no waterproof bases (such as stone, concrete or fire bricks) (CADECOM, CRS, 2015).
- There needs to be further study to check the existance or not of local wood types which can last in a stable dump context and more generally about local practices.

C. Walls, structure and openings

Improvable practices

- Sometimes, walls are built with defficient quality (CADECOM, CRS, 2015), and there are cases where the quality of the masonry is too poor to support its self-weight or the weight of a heavy concrete lintel (Kloukinas et al. 2019a).
- Half-brick thick walls are often built to economise bricks. They usually have weak bonds at corners and no reinforcement of ring beams (UN-Habitat s.d.).
- Some buildings present weak mud mortar, thick (> 20 mm) and uneven joints (Kloukinas et al. 2019a).
- The use of fired bricks and cement mortar often leads to more spacious living spaces. However, longer and higher walls with more and larger openings can also result in higher seismic vulnerability if the building quality does not increase.
- If improperly built and reinforced, concrete constructions are the most dangerous. Total or partial collapse can cause deadly injuries as they are heavy. The financial restrictions of households affect the quality of the cement mortars which decreases the strength of the structure (Kloukinas et al. 2019a). Also, using concrete is challenging due to scarcity of good quality aggregates and clean water.
- Lack of cross-bracing in timber structures originates a lack of lateral stability. Also, when wood is untreated it easily gets infested by termites.
- Timber lintels over doors and windows are rarely built respecting the minimum extension of 200mm beyond the opening. Moreover, many of the openings are usually not supported by lintels (Kloukinas et al. 2019a).
- There is also a lack of good connections between walls and between walls and roofs (Kloukinas et al. 2019a).

Recommendations

- Masonry walls heights should not exceed 8 times its thickness for increased structural stability and for better resistance to earthquakes. Ideally, a 2.4 m high wall should have a thickness of 0.3 m, and so structural masonry walls should be one-adobe or one-brick walls and not half-brick or walls (Government of Malawi, 2010).
- It is recommended to set up well connected buttresses in case of less thick walls, and it is necessary that internal walls are connected to the outside walls (CRS, 2018).
- The unsupported length of a masonry wall between cross walls should not exceed 14 times its thickness (for a 0.3 m thick wall, the maximum distance between cross walls should not exceed 4 m). This length can be reduced by the introduction of piers (Gov. of Malawi, 2010).
- Buildings should avoid features where there is unsupported masonry such as gable walls and pillars, liable to collapse in earthquakes or under important wind loads. (Government of Malawi, 2010). When they exist, pillars or internal walls need to be connected to the external walls by bonding the brickwork of both elements.
- Cracks should be repaired quickly, as they can allow water penetration and rapid degradation of the structure.
- Timber poles should be treated against insects attacks and moisture with locally available products (Shelter Cluster Malawi, 2015) or traditional treatments.
- It is necessary to reinforce timber elements through bracing, and to maintain buildings in a regular basis.
- Exterior verandas should be separate elements so that any movement will not affect the main structure in case of an earthquake or wind storm (Government of Malawi, 2010).
- The presence of ring beams and wall plates provide additional confinement to the masonry, in combination with the fixing of the roof structure (Kloukinas et al. 2019a).
- The quality of earth bricks is determined by the respect of the time needed for clays to react to water before producing bricks, by the ratio of sand and clay, by the amount of water used, and by care taken during moulding and drying. In adobe walls, the mortar should behave the same way as the bricks it attaches and should also have a glue quality. All joints must be fully filled with mortar.
- It is necessary to build walls strong enough to resist pressure from flood waters or from strong winds, or ensure that light walls are well anchored to foundations, and braced to ensure lateral stability (Shelter Cluster Malawi, 2015).

D. Roofs

Improvable practices

- Wall plates are rarely used under the rafters in some areas (e.g. Salima), and rafters generally seat directly on top of walls. This often results in severe local damage to the walls due to stress concentration (Novelli, 2018).
- The roof structure is not usually reinforced with bracing systems and the slopes are usually not enough inclined to guarantee rain water outflowing and wind resistance.
- The percentage of properly constructed timber roof trusses is very small in some areas (Kloukinas et al., 2019a).
- Some thatched roofs have an insufficient roof slope, allowing rain water to stagnate and penetrate (UN-Habitat s.d.).
- CGI sheets are lightweight, therefore vulnerable to wind if not properly secured (Government of Malawi, 2010).

Recommendations

- Beams need to be fitted to posts and wall plates need to be fixed to the walls with tie wire (CADECOM, CRS, 2015).
- Wall plates are highly recommended to improve connections between walls and roof structure and to prevent stress concentration at rafter-wall contact points (Novelli, 2018).
- The timber roof structure should be well dried and after that coated with a preservative treatment such as used motor oil to prevent insects attacks (Bureau TNM, 2016).
- Roofs can be lifted off as a result of open verandas that permit wind to penetrate the roof. It is important to build separate roofs for the veranda and the main construction, particularly when they are built with iron sheets.
- A roof may be lifted off due to the vertical pressure (suction) of strong wind. There may be two strategies to deal with this:

  → Strong connexions tying down, technically difficult to build, where there will usually be a weak point in which the structure will break up. Then, the cover will blow off, but also the roof structure and even some parts of the walls. If this is the researched solution, it is necessary to firmly attach the roof to the walls and all the different element of the roof to each other in order to avoid the dangerous uplift effect, particularly with CGI sheets roofing.

  → Choice of a safe weak point in the structure, where an element is known and identified as the element which will receive a controlled and non-fatal impact. For example in thatched roofs, thatch may fly away and need to be replaced, but the rest of the structure will remain.
- In thatched roofs, extended eaves help to keep the rain off the walls of the house, protecting the walls from heavy rains and channelling the water into shallow drainage trenches below (Shelter Cluster Malawi, 2015).
- In CGI sheets roofs, roof overhangs must not be too important in order to prevent roof's uplift, unless there is a separate *khonde* or veranda not connected to the roof structure (Shelter Cluster Malawi, 2015).
- For thatched roofs, consider increasing the angle to 45 degrees to encourage more water to run off the roof (Shelter Cluster Malawi, 2015).
- There needs to be further studies about what treatments for timber, thatch and bamboo are used by modest families.

Walls with insufficient thickness and an important height are dangerous in the events of a disaster as they are not stable enough. CC- Ignasio Ngoma

Constructions with various dangerous elements such us disconnected masonry columns and very thin and high masonry walls. CC- Ploughmann

Unsupported masonry gables tend to fail in the out-of-plane direction in the event of an earthquake. This house's gable fell after the Karonga earthquake in 2009. © Sonia Molina

CGI sheets roofs can easily be blown off at high speeds in the event of strong winds creating an important risk. When the roof of the veranda is not separate from the roof of the main structure, the uplift of the entire roof can more easily happen. House in Karonga. © Sonia Molina

5.3. Lifespan, maintenance and adaptation

Sources: Bureau TNM (2016), CRS & CADECOM (2015), Culture Grams (2018), Moles et al. (2017), Shelter Cluster Malawi (2015), Twingi (s.d. a.), UN-Habitat (2010),

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

Lifespan and maintenance

- Many families undertake maintenance in a regular basis, as it is crucial to have more lasting houses. It may include small reparations or structural works. When the walls and the surroundings of the building (drainage) are well maintained, they provide additional protection from floods. When the roof is well maintained, it provides protection from storms and strong winds.
- The drainage channels are maintained keeping them free of any object that could obstruct the water flow (Bureau TNM, 2016).
- Fired bricks are very usually set in mud mortar and for more durability are plastered with a mortar of mud and lime for added durability (UN-Habitat, 2010). Burnt brick walls need regular maintenance of mortar joints where the masonry is not protected by plaster. Deteriorated mortar joints can be restored through pointing (Bureau TNM, 2016), using the same mortar used to build (earthen or cement based mortars). Sometimes, when using an earth based mortar, pointing can be done with cement mortar what protects the earth mortar while reducing the cost of masonry.
- Plastering is one of the works that is done more regularly, in walls, floors and verandas, particularly in earthen houses. Plaster in the walls protects the building against erosion and moisture, and plaster in the floor provides better conditions of use and hygiene.
- Women are very involved in plastering. This task is completed once a year as water hitting an earthen surface has a great impact on the structure (Twingi, s.d. a) following the rainy season cycle, ideally using the same mud used to plaster the wall originally (Bureau TNM, 2016).
- In Ndungunya (Phalombe District), women are responsible for mud smearing (*kuzila*) as a routine maintenance which happens weekly depending on availability of resources (time, labour and soil) whilst major maintenances such as roofing or fixing of walls and doors is done by men in the community annually. In a scenario where the women don't have any male figure around, they usually have to use hired labour (CADECOM).
- Natural additives like straw and cow manure are added to the mud plaster to make it more durable increasing the resistance to moisture of the mud, thus preventing the occurrence of fissures during the drying process (Bureau TNM, 2016). This is a common practice.
- The exteriors of homes are often whitewashed (Culture Grams, 2018).
- Tarpaulins distributed after disasters (e.g. floods of 2015), are usually employed to repair the remaining parts of the houses: temporary walls, roofing, etc. (Global Shelter Cluster, 2017).
- Thatch roofs are repaired when necessary, even once a year, in order to preserve waterproofing. In some zones, the grass for thatching is prepared in conical bundles which are simply laid onto the roof structure without being tied, except for the first layers at the bottom. When one bundle is rotten, it can be easily pulled out and replaced by driving another bundle at its place. This practice facilitates maintenance allowing for a fast and a very localized replacement of damaged parts (Moles et al., 2017).
- There is an evolution of thatched roofs that is becoming common. A plastic membrane is fitted prior to thatch providing additional protection especially

Woman cladding a wall with earth plaster. CC- Gregory S.

Woman plastering a floor in Mawudzi, Salima. © Jon Twingi

Thatched roofs are repaired when necessary. This house in Chome (Rumphi) presents thatch bundles which can be easily replaced when they get rotten. © Jon Twingi

Extensions are very common. More often, new constructions are built in the same plot completely separated from the existing ones. This house is in Mwamkenja, Chitipa. © Jon Twingi

at times when there is a shortage of thatching material (CRS, CADECOM, 2015). There is a need to study if this solution can accelerate the rotting of the straw.

Adaptation

- There is often an evolution process involved in housing. In the early years, the floor will be made of earth and the roof thatched. As soon as families can afford it, they change to corrugated iron sheets (*malata*) and concrete floors. The adobe bricks may also be replaced with burnt brick with cement plaster some time later (UN-Habitat, 2010).
- Extensions are very usual, and they permit people adapt houses to needs and to means available.

Lifespan and maintenance

- Timber poles rarely stand on waterproof elements (e.g. stones, fired bricks), what decreases the structure durability allowing posts rotting.
- Timber and wooden members are not always treated against termites for lack of means. Renewal of the treatment presents the same problem. As a result of this, timber is attacked by termites, carpenter bees and various other wood boring and eating insects (MacLean, s.d.).
- Thatch roofs have good qualities, but they also require frequent maintenance moreover if they are not properly executed. Thatched roofs also have the disadvantage of being flammable and they may be a nesting place for insects.
- CGI sheets are dangerous in the event of strong winds. When sharp and quite heavy CGI sheets are uplifted by winds they start flying and become a potential cause of damages to persons, animals and goods.
- Corrugated metal sheets get rusted with the time and need to be replaced, Also, metal sheets need to be sufficiently thick (gauge ≤ 30) and they should be replaced with suitable ones when it is not the case (Bureau TNM, 2016). This is not always done by lack of means.
- CGI sheeting is imported and expensive to replace when needed.

Adaptation

- There are dangerous extensions, such as heavy-weight porches and roof extensions on isolated pillars (Kloukinas et al. 2019a).

When wooden poles are in direct contact with the ground and are not regularly treated or replaced, they are vulnerable to rising damp and decomposition. Veranda in Lifidzi, Salima. © Jon Twingi

Maintenance of roofs is crucial to block water from penetrating the walls and to make them stay stable. House in Mwamwiyo, Karonga. © Jon Twingi

5.4. Comfort, use and aesthetics

Sources: Culture Grams (2018), Government of Malawi (2010), MacLean (s.d.), Twingi (s.d. a.)

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

Comfort

- Temperature and moisture are crucial for comfort in inner spaces. Earth and thatch help have better conditions regarding these, as thatch is a good insulation material and earth a good controller for moisture.
- Most houses have verandas (*khonde*) and other exterior covered spaces where many daily life activities take place as these shadowed spaces are very comfortable in a tropical climate.
- In Salima, buttresses are used on the outside of the houses to create a space which is not exposed to sun. These elements are generally located on the longest wall of the front side (Novelli, 2018).

Verandas (*khonde*) and other exterior covered spaces where many daily life activities take place as these shadowed spaces are very comfortable in hot days. House in Penganga, Ntcheu. © Jon Twingi

- Small openings in the masonry walls allow adequate ventilation in the interior of the buildings in this hot humid country. These openings are particularly important for ventilation in kitchens, where they are very common.
- Thatch is a good material for roofing and is adequate to promote local skills when available. It protects from the rain, may be locally available, provides insulation from the sun, offers good ventilation, has limited or no environmental impact and can last for many years if the right material is used and that it is fitted properly (Government of Malawi, 2010).

Use

- Kitchens are often placed in a separate building, and sometimes cooking is done outdoors, what permits to avoid smoke inside the houses.
- Structures for food drying are present outside the houses but also in the interior, where there appear some structures for smoking food.

Raised food dryers are present inside and outside the houses. Structure in Chimwendo, Karonga. © Jon Twingi

Aesthetics

- Decorations represent the will of families to beautify their homes. Most of the time they are accomplished by paintings on the side of walls. Many families make unique drawings, designs and they even write messages in their coatings with different colors of mud (Culture Grams, 2018) usually taken from the local soils. Through a study with several interviews (Twingi, J. s.d. a), it was said that there was no reason behind the paintings other than to add beauty.
- Most families take care of their plots, keep them clean and try to make their places beautiful. An example of this is the presence of ornamental plants or flowers in some homesteads.

Top: decorated facade with a written message (Mwamkenja, Chitipa). Bottom: house with ornamental plants (Khisha, Nkhotkota). © Jon Twingi

Comfort

- The use of CGI sheets without false ceilings and good ventilation in the gables causes discomfort for inhabitants and may induce health issues. When a shiny CGI sheet is installed, it reflects some solar radiation, but heats up and radiates the heat inside the house. In fact, the sun heats up metal roofs to temperatures of up to 40 degrees (MacLean, s.d). When CGI sheets rust, they become darker in colour and consequently reflect less radiation. Thus, the interior of buildings become hotter as the CGI sheets rust.
- Apart from their thermal disadvantage, CGI sheet roofs are noisy during rainy periods. False ceilings reduce the noise and create thermal buffer zones.
- Some houses do not have openings, or they are too small. This makes houses too dark, and also avoids a good ventilation.

5.5. Health issues related to housing

Sources: Barnes et al. (1994), Bureau TNM (2016), Chimulu et al. (2015), CRS (2019), Government of Malawi (2010), IHME (2020), Malawi Ministry of Natural Resources, Energy and Environment (2010), Malinski (2008), Mpanga (s.d.), Mpofu (2014), ourworldindata.org, Richardson (2010), Shelter Centre & ProAct Network (s.d.), Shelter Cluster Malawi (2015), USAID (2016), World Bank

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

Water and sanitation

- Access to drinking water has improved: 90.2% have access to improved water, up from 42.5% in 1990 (World Bank). Still, 4.55% of deaths in Malawi are due to unsafe water, down from 10.13% in 1990 (IHME).
- In some houses there are hand washing facilities, usually close to the toilet. There are also wash stands and plate drying rack to encourage safer hygiene practices (CRS, 2019).

Small openings in the masonry walls allow adequate ventilation in the interior of the buildings, particularly in kitchens. Kitchen in Kalinyka, Ntcheu. © Jon Twingi

- The latrine is usually placed at a reasonable distance from the house. It should be sufficiently distant from the water source in order to protect it from possible contamination (Bureau TNM, 2016).
- The location of the latrine should consider the direction of the prevailing wind to reduce odour and flies. The same consideration should be extended to neighbouring properties (Government of Malawi, 2010).
- Also, it is recommended to raise the foundation of the latrine and the latrine itself in areas prone to floods. raised latrines prevent the outfall of human waste, dangerous for the health (Bureau TNM, 2016).
- Cement floors in latrines are an evolution for better hygiene and maintenance.

Kitchens and improved stoves

- Most kitchens are ventilated, with openings in the upper part of the walls, or openings in the masonry work to let the smoke out.
- Thatched roofs don't provide a perfect solution, and have the disadvantage of being flammable, but they also allow smoke pass through them as they are porous and smoke can treat the thatch against insect attacks.
- The use of dry wood produces less smoke (Shelter Cluster Malawi, 2015), but this is not always possible due to the scarcity of wood.
- Improved cooking stoves, unlike traditional stoves, emit less smoke and hence black carbon (Barnes et al., 1994). Reduced smoke and black carbon emissions also reduce risks of respiratory and eyes infections as well as mortality rates of people, especially women and children who spend most of their time in the kitchen. These stoves reduce concentrations of indoor pollution that cause respiratory illnesses. Health benefits include reduced indoor air pollution that cause health hazards (Malinski, 2008). Different improved stoves exist, for example:

  → *Chitetezo Mbaula* (meaning "protecting stove»): wood fuel and portable improved cookstove made of pottery clay with between 30% and 60% efficiency. Though this stove does not mitigate indoor air pollutions to sufficiently low levels recommended by World Health Organisation (WHO) to avoid respiratory illnesses, the stove remains a transition technology to completely replace wasteful fires in the long term (Mpofu, 2014).

  → *Changu Changu Moto* (meaning «Fast Fast Fire»): introduced in the year 2004 in the northern district of Nkhatabay by the charity organisation Ripple Africa. The stove is made from locally available materials (26 adobe bricks and mud mortar), mounted inside the householders kitchen. The cook stove is about 70cm long, 35cm wide and 22cm high, with two doors and two pot sits. Reports indicates that the adoption rate is high (98% of the households at Usisya in Nkhatabay have adopted the stove). As the stove reduces wood usage, there is less risk of burns and smoke inhalation (Chimulu et al., 2015).

  → Fuel efficient stoves promoted by USAID: they improve combustion efficiency by 40% to 80% and substantially decrease smoke emissions and exposures and decrease the risk of pneumonia (USAID, 2016).

Water and sanitation

- Lack of drainage creates breeding ground for mosquitoes and other water-borne diseases. This should be monitored and remedied on a regular basis.
- Poor sanitation remains a major concern, as it puts pressure on health systems due to increased water and airborne diseases (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).
- There are two major avenues of contamination of water; the use of water from unprotected wells and improper storage facilities, and the practice of locating toilets near water sources (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).

Hand-washing facility outside a pit latrine.
CC- SuSanA Secretariat

Latrines and showers are usually built using vegetal materials such as grass, timber, bamboo or reed. Latrine in Chome, Rumphi. © Jon Twingi

Hand pump and and laundry facility in a village.
CC- Gregory S.

Kitchens always present openings to let the smoke out. Smoke has very bad impacts on people's health, but at the same time it treates thatch against insect attacks: Thatched roofs let the smoke out more easily as they are porous (William, Rumphi). © Jon Twingi

- In the informal settlements there are important health problems. For instance, in the Spontaneous Area of Mchesi in Lilongwe, there are increased health risks related to HIV/AIDS, malaria and outbreaks caused by unsanitary conditions. This Area has inadequate sanitation facilities, drainage systems, and rubbish collection services. Refuse and human waste fill the common areas, making sanitation related diseases rife and contributing to environmental degradation and contamination of water sources. Water related diseases such as cholera, dysentery and typhoid is also proving to be a problem in Mchesi (Mpanga, s.d.) and other areas. For the whole country, incidences of cholera were mostly found in high density settlements, due to unhygienic conditions, poor water sources, unavailability of toilet facilities, and indiscriminate disposal of refuse (Malawi, Ministry of Natural Resources, Energy and Environment, 2010).
- Some latrines are placed in plots in such ways that the wind direction goes from latrines to houses and kitchens, what should be avoided for comfort and health reasons.
- Not very often latrines have concrete floors, which is perceived by inhabitants (for example in a Focus Group Discussion in Thyolo) as «safe» (CRS, 2019).

Kitchens and traditional stoves

- The small size of windows or lack of windows and the general lack of ventilation is an important factor creating health problems along with cooking fuel.
- The traditional cooking system consists of three stones placed on the floor of the kitchen, with firewood inserted between the stones. Pots rest on top of the stones. Although mobile, the system produces an open flame, which fills the kitchen with cough-inducing smoke. Pots are not steady and sometimes tip and spill. The health impacts from traditional three-stone fires among women and infant children are well-documented.
- Lower respiratory infections are the 2nd biggest cause of death for under 5s in Malawi and household air pollution is the 4th biggest risk factor for deaths for under 5s (ourworldindata.org). Around 300 per 1,000 children under 5 are diagnosed with pneumonia every year (USAID, 2016). Indoor air pollution from cooking is among the top six health risk factors contributing to Malawi's burden of diseases and deaths (Mpofu, 2014).
- Field observation revealed that maize and cassava residues are used as other alternative cooking materials for the stove. The stoves should be systematically evaluated in terms of emissions of harmful pollutants and contribution to the greenhouse gas emissions compared to different cooking materials (Chimulu et al., 2015).

Persons with disabilities

- Persons with disabilities represent around 14% of the Malawi's total population (World Health Organization). According to the Government of Malawi (2019), the National Building Regulations (not existing in 2020) should include comprehensive provisions for ramps, lifts, handrails and wheelchair spaces. These provisions would be aligned with the mandate of the Disability Act (2012) and UN Convention on the Rights of Persons with Disabilities, signed by the Government of Malawi in 2007. The Act mandates that all architectural drawings for public and institutional buildings comply with the standards of universal design (Government of Malawi, 2019).

Construction

- Lack of proper foundations and damp-proof courses allows dampness to rise through the walls causing unhealthy living conditions due to moisture.
- The floor may suffer from rising humidity when it is not risen in the form of earth mounds. Bad quality flooring can activate various parasitic diseases.
- Malaria is a significant issue. As stated before, housing characteristics have an influence over the spread of this disease: openings without protection, open eaves, lack of openings for ventilation.

Changu Changu Moto stove is one of the several models of improved stoves existing in Malawi. The stove reduces wood usage, there is less risk of burns and smoke inhalation and two things can be cooked at the same time on the two burners. © Ripple Africa

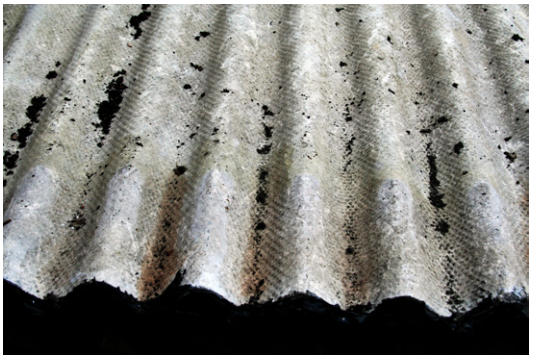
The use of CGI sheets without false ceilings and without ventilation in the gables causes thermal and acoustic discomfort. Market in Lilongwe. © Roderick Vd.

Traditional three stones stoves are very frequent in Malawi. The system produces an open flame, which filles the kitchen with cough-inducing smoke and pots are not steady and sometimes tip and spill. Top: interior of a kitchen in Champiti Ntcheu © Jon Twingi. Bottom: three stones stove in a kitchen © Ripple Africa.

Asbestos

- Asbestos is a rock-based fibrous mineral. The World Health Organisation (WHO) has assessed the effect of exposure to asbestos on human health and inhalation of asbestos fibres has been shown to cause different diseases. Permanent structures sometimes present asbestos-cement roofing sheets, (Mpanga, s.d.) particularly in cities. Asbestos can also be found in water pipes, ceilings, floors, thermal, fire and sound insulation. It is now banned in over 40 countries worldwide (Shelter Centre & ProAct Network, s.d.).
- There is significant potential to release asbestos fibers when disturbed by disasters. Health risk to occupants of affected buildings and for people working in waste removal is likely to occur. Even in an emergency context, a few key steps can be taken to minimise health risks due to asbestos (Shelter Centre & ProAct Network, s.d.):
    1. Identify the locations of asbestos materials and assess the risks.
    2. Ensure that people are informed of the risks and best practice.
    3. Minimise the disturbance of asbestos containing materials.
    4. Minimise the extent to which people have contact with asbestos.
    5. Ensure that waste is securely stored and adequately labeled.

Raising dampness creates unhealthy living conditions inside the houses due to moisture. © Sonia Molina



Corrugated asbestos cement roofing sheet.
CC- Leo Reynolds

Living practices

- Trachoma is spread by living spaces with animals, what usually happens in the rural areas in the country.
- The spread of malaria is also linked to living habits such as not using mosquito nets to protect persons while sleeping, lack of ventilation, night time heat indoors and under bed nets.

Mental health

- Mental health issues should be further studied in future researches.

5.6. Gender issues

Sources: Concern Universal (2012), CRS (2019), CRS (2020), Mpofu (2014), USAID (2016)

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

- Women are actively involved in the construction and maintenance of houses, what gives them resilience as they know how to build and better maintain their dwellings. Women are particularly involved in finishings of floors and walls in earthen houses. There should be further studies regarding other stages or tasks of construction where women are particularly involved.
- Benefits of using improved cookstoves include shortened cooking time, reduced fuel consumption and frequency of collecting biomass thereby getting more time for other activities (Mpofu, 2014). For instance, *Chitetezo Mbaula* stove reduced firewood collection time between 43% and 50%, and fuel wood collection trips were reduced by 44% (Concern Universal, 2012). Users of this type of stove reduces cooking time by 9% compared to using the traditional fireplace (Mpofu, 2014).
- Women using improved stoves say that the most important benefit is her time saved: «I collect firewood only one time a week, food cooks quicker and my pots stay cleaner and take less time to clean. The stove has given me more time to care for my family» (USAID, 2016).

Detail of decorations in an exterior wall (Malata, Kasungu). © Jon Twingi

- Women and children spend more time indoors cooking or socialising (Mpofu, 2014). Most daily cooking is done by women, who usually cook in traditional three stone stoves, open fires in villages, in wood-burning stoves in some households. Malawian women and children are thus more exposed to respiratory diseases due to smoke inhalation.
- Safety inside houses is an issue for women. For example, according to women participating in a FGD in Thyolo district, in houses, the absence of a lock does not help to not feel safe» (CRS, 2019).
- Overcrowded houses are seen as a problem by most women. For instance, according to interviews with beneficiaries of a project by CRS/CADECOM «one bedroomed house does provide protection, but it is not gender sensitive because of its small size which renders girls sleeping on a sitting room with their brothers and this is not culturally acceptable» (CRS, 2020).
- Firewood is increasingly scarce, and finding what remains is not easy. (USAID, 2016). It takes a lot of time to collect biomass fuel, and because of this, women also have less time for income generating activities, including farming, as well as other important chores like child caring (Mpofu, 2014) or leisure.

Women are involved in the construction, maintenance and protection of houses against particular hazards. Houses become more resilient thanks to this knowledge and know-how. Woman plastering in Chisi, Nzimba. © Jon Twingi

5.7. Green design and environmental issues

Sources: Bureau TNM (2016), Chimulu et al. (2015), Cleantech Malawi (2012), CRS (2019, 2020), Government of Malawi (2010), Kloukinas et al. (2019a), Mpakati-Gama et al. (2012), Mpofu (2014), Ngwira & Watanabe (2019), Pullanikkatil et al. (2016), Richardson (2010), Shelter Cluster Malawi (2015), USAID (2016), Wanjohi & Smyser (2013)

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

Renewable materials

- Environmentally, vernacular habitats involve the use of renewable materials, provided that adequate programmes to manage wood resources are in place.
- Earth and straw, used by many households for the construction of their houses, are renewable materials with no environmental footprint. These materials have a good acceptability according to beneficiaries in a project undertaken by CRS/CADECOM who stated that they «did not notice any problem with soil and straw use» (CRS, 2019).

Many constructions in Malawi are built using local, renewable materials with little impact in the environment when they are well managed. This image shows the construction of a rammed earth house in Nisanje, Lilongwe. © Jon Twingi

Management of wood resources for construction

- The use of fired bricks has aggravated rapid deforestation and is discouraged by the Government (Kloukinas et al., 2019a). According to Mpakati-Gama et al. (2012) the Malawi National Environmental Policy (1996) urges the building designers and developers to switch from the conventional brick making to the use of options such as the stabilised cement blocks, concrete solid or hollow blocks and earth (adobe) in order to curb deforestation.
- CGI sheets ant thatch have the advantage of not being heavy, and thus, to require light supporting structures, which helps save wood.
- The use of sustainably harvested milled timber or eucalyptus poles is a good practice. In order to cut a tree, it is necessary to have permission of the District Council and the Department of Forestry, Ministry of Natural Resources, Energy and Mining (Shelter Cluster Malawi, 2015). According to the village leaders of Coroa «Government and local authorities ask to plant from 2 to 5 trees every tree you cut (CRS, 2019).
- In zones where lumber is not available bamboo is used in construction, and it can be a more sustainable resource than wood, as it grows faster (CRS, 2019).

Gardens for the self-provision of food for the families are present in many occasions, which is a good practice both socially and environmentally. House and garden in Karonga. © Sonia Molina

- In traditional houses, there is a use of all parts of good quality trees for construction, even those parts which are twisted. When a tree is cut down profit is taken of the whole tree. This is an image of the frugal use of resources.
- Pine tree is recommended for structural use for environmental and mechanical reasons (Bureau TNM, 2016).

Management of wood resources for cooking

- Some good practices regarding foraging for wood to cook are to cut down branches and not trunks and to split firewood before using it to burn less wood (Shelter Cluster Malawi, 2015).
- Improved cooking stoves are a transition technology that use biomass fuel and their energy consumption efficiency are more than 30% in laboratory settings (Mpofu, 2014). In fact, wood usage decreases before and after adoption of improved cooking stoves. For *Changu Changu Moto* cooking stove, wood usage declined by 59.55 kg (equivalent to 2 bundles) from 89.23 kg (equivalent to 3 bundles) per household per week following the adoption of the stove. This contributes towards sustainable forest utilization and management. Cooking technologies with narrow openings are best wood savers (Chimulu, et al., 2015).

Deforestation due to burnt bricks production or other causes related to housing

- Each brick house uses 4 metric tons of wood on average in traditional clamps (Ngwira & Watanabe, 2019). An average clamp consumes around 20 metric tons of wood to fire 40,000 bricks, generally coming from big trees, what puts enormous pressure on the remaining forests in Malawi (Tara, 2014).
- In 2012 it was calculated that the brick industry in Malawi alone consumed around 850,000 MT of fuelwood per year. Only taking into account the brick industry and with no increase of wood consumption, the entire country would be deforested within 25-30 years from 2012 (Cleantech Malawi, 2012).
- Wooden structures require large quantities of wood, what has a significant impact on local deforestation problems (Kloukinas et al., 2019a). For instance, the use of trees for roof and veranda structures is a problem in some zones.
- Traditional cookstoves include all cookstoves that use biomass fuel and have fuel consumption efficiency of less than 10% (Mpofu, 2014) and their environmental impact is important. Malawi's rapidly growing population and its growing demand for fuelwood have been driving deforestation and forest degradation in recent decades. The loss of Malawi's forests is a major factor contributing to soil erosion, which not only decreases agricultural productivity for Malawi's farmers (more than 80% of the population), but results in siltation and sedimentation of rivers and a loss in loss in hydropower capacity, further impacting the country's economy (USAID, 2016).

Scarcity or over-extraction of materials

- Shortage of sand is linked to increasing demand in the construction of dwellings using cement based technologies (Pullanikkatil et al., 2016).
- Sometimes, in degraded environments and more particularly after a disaster, the community members depend on the local materials such as bamboo for construction of their houses, what leads to environmental degradation (CRS, 2019). There is a need of good management of natural resources.
- In some areas, grass for thatch has become scarce and it is seasonal hence it is difficult for community members to build thatched roofs (CRS, 2020).

Environmental degradation

- Regarding stone and gravel, some stone is split using heat generated by burning tyres, what has an adverse environmental impact (UN-Habitat, 2010).

When a tree is cut down profit is taken of the whole tree. This is an image of the frugal use of resources as even twisted parts of good quality timber are used for the poles of the veranda. House in Kabomolo, Chitipa.
© Jon Twingi

The production of fired bricks has a significant impact on local deforestation problems. Kilns for traditional brick production in Benga, Mchinji.
© Jon Twingi

Over-extraction of materials can be a problem in some places, as it can create environmental issues, but also scarcity of materials in some time. Bwanzi, Mchinji.
© Jon Twingi

5.8. Sociocultural practices fostering resilience

Sources: CRS (2019), CRS (2020), Hajat et al. (s.d.), Huang (2017), Trogrlić et al. (2018), UN-Habitat (2010), Zeleza Manda (2007)

The practices presented hereafter are not exhaustive, and some of them need to be better documented and studied. These practices are continuously evolving and need to be analysed case by case and in a more localised scale.

Mutual support

- In Ntcheu District (Huang, 2017), there is a cultural habit to help one another build their home, what solidifies social relationships, as host families offer food to neighbours in exchange for labour in a mutually recurring cycle.
- Under normal circumstances, saving is very difficult for low-income households in Malawi though some Malawian households have savings in banks. There are local relationship-based savings groups called *chilemba* or *chiperegani* (UN-Habitat, 2010).
- The Malawi Homeless People's Federation is a social movement comprising a number of savings groups formed in communities in slums. Federation members are mostly women and men currently renting houses in such areas across Malawi. The Mchenga Fund is a housing finance arrangement for the federation. Its name expresses the fact that, as an individual, a poor person can rarely change his or her circumstances; but if people come together, collectively they can change their livelihoods (Zeleza Manda, 2007).
- In a shelter project by CRS/CADECOM in Thyolo and Phalombe the communities participated and made decisions during the selection of the most vulnerable; they contributed with materials such as quarries and bricks; identified builders; fetched water; cooked for the drilling team; they helped the artisans and directed them on the side where the wind blows and about the water point. There was peaceful and productive collaboration during the construction of shelters. The construction activities demonstrated the involvement of the affected population and the maximizing of the local livelihood opportunities (CRS, 2019).
- In the same project by CRS/CADECOM the inclusion of the most vulnerable to the assistance was an underestimated factor in the design phase. The number of very vulnerable beneficiaries who could not give their own contribution during the project resulted higher than expected. Nevertheless, informal community support often covered what the beneficiary was supposed to provide (CRS, 2019).
- In places such as Ndungunya (Phalombe District) the construction of houses is an individual task and each household has to construct their own house even after disasters. Nevertheless, in a scenario where the owner of the household is an elder person or a person with disability, then at times, through the local leaders the community can construct the shelter for them. Other times, the church that the individual belongs to may request a group effort in constructing the house for their church member (CADECOM).

Rendering a house in a training by CRS. © CRS

Self-provision

- Gardens for the self-provision of food for the families are present in many occasions, which is a good practice both socially and environmentally.
- In some zones, there is no or almost no cost attached to some (or most depending on the materials) of the materials that families use to build their houses as they make them on their own, for example unburnt bricks (CRS 2020). Indeed, apart from any hired labour that might be used by some owners, adobe bricks cost no money to produce, which makes them an ideal material for low-income Malawians. (UN-Habitat, 2010). There needs to be further studies to analyse why materials are costless case by case: do materials belong to the entire community (e.g. wood, earth for bricks, grass...)?, is transportation undertaken by families?
- Other ways of saving for a dwelling include collecting together materials, bought in advance. Thus, corrugated iron sheets or bricks may be bought with money at harvest time (UN-Habitat, 2010).

Preparedness practices, coping and mitigation strategies

- Houses are strengthened before the expected heavy rains, strong winds and floods by communities in the Lower Shire Valley. The foundations are improved by adding an extra layer of mud around the houses. Furthermore, roofs are strengthened by the process of thatching (i.e. adding extra layers of grass and tree branches) and covering the roof with sheets of plastic, thus preventing the water leakage. Those living in the houses made of mud-bricks might also add additional layers of mud (Trogrlić et al., 2018).
- Communities in the Lower Shire Valley develop and employ a range of coping and mitigation strategies to minimise the effects of most common hazards on their lives and livelihoods, particularly flood and droughts. These actions include (Trogrlić et al., 2018):

  → Livelihood adaptation: shifting of the planting practices is used to minimise the flooding impacts. Some families own farming land both next to the river banks and upland. Based on the indigenous flood forecasting indicators, some

farmers will change planting places (i.e. plant in the uplands) or decide to plant earlier in the season.

→ Food and fodder management: food storage is one of the strategies used to prepare for floods. Maize flour, as the main nutrition, is stored into sacks to prevent it from getting moist. However, food storage was an exception, as due to poverty, community members are very often unable to keep food supplies or fodder for cattle and other livestock.

→ Livestock management: apart from raised structures for small animals, when noticing heavy rainfall and water levels increasing, big animals (cattle) might be relocated to graze in the uplands, and the community members will advise each other not to feed the cattle close to the river banks.

→ Relocation and evacuation: when the advice for relocating from the lowlands is given, some people will move to the uplands, where there are several options where people may stay: in their own houses, with relatives, in the evacuation centres (e.g. schools), temporary shelters, or renting a house.

→ Preparation of houses and temporary shelters: communities emphasized several ways through which the houses are strengthened prior to the expected heavy rains, strong winds and floods.

Indigenous early-warning systems

- Within the communities natural signs and patterns are monitored and provide indications of weather trends from seasonal to short term time frames. Some of these traditional warning systems are explained in the table below (Hajat et al., s.d.):

- There are many calls on money from family members and others, and thus cash is rarely saved. Many people earn their cash at particular and known times (end of the month, harvest time), and so social pressures to share it exist (UN-Habitat, 2010).
- In places such as Ndamela (Nsanje District), shelter or house construction is completely an independent task of the owner, and family members are supposed to work for their own house construction. They do not get any kind of assistance from fellow community members unless it is an initiative coming from humanitarian authorities during floods (CRS).

Timeframe	Sign	Description
Variable	Prevailing winds (direction)	Local communities often associate wind direction with rainfall patterns, what differs depending on locality. Violent thunderstorms will usually come from a certain direction, or wind from a certain direction does not bring rain. Seasonal rainfall quantity and patterns can change depending on the prevailing wind direction.
Seasonal (months)	Bird nests woven with the hole facing up, down, or to the sides.	Black sunbird, scarlet sunbird, and the masked weaver building their nests will reflect the upcoming rainy season. If the hole faces up, the season will be dry. If the hole faces downward, it will be a very wet season. If the hole is to the side of the nest, it faces away from the prevailing wind.
Seasonal (months)	Termite hills with the hole facing in different directions	Similar to the nests above, the main entrance to the hill faces the opposite direction as that of the rainfall.
Seasonal (months)	Mango trees fruiting, the abundance of fruit	Mango trees fruit before the rainy season. If trees feature a bumper yield, it is likely that the upcoming season will feature poor rainfall.
Seasonal (months)	Grasses (Local name- Ndungo)	When this grass appears, the rainy season will start within the month.
Medium (weeks)	Appearance of swallows (bird)	Swallows are migratory birds, the appearance of which heralds the imminent start of the rainy season. Once swallows appear, the rains are not far behind.
Medium (weeks)	Trees species sprouting leaves after the dry season.	Tree species sprout leaves when the rains are only weeks away. This is used to monitor the timing of the season. Trees include: *Malambe* (Baobab), *Nthundu* (*Ficus Capensis*), *Mtondo* (*Cordya Africana*), *Mtumbu* (*Kirkia Acuminata*), *Mgoza* (*Sterculia Africana*), *Masau* (*Ziziphus Mauritiana*), *Kachere* (*Ficus Natalensis*)
Medium (weeks)	Very hot temperatures at night	Excessively hot temperatures at night are associated with the end of the dry season. The rains usually follow in the coming weeks.
Short Term (days, hours)	Termites storing food.	When there is a break in rainfall of a couple of days, these termites emerge from their holes to gather food. Once the rain is about to come, the termites disappear deep into their holes again. Sighting these termites gathering means there is no rain expected within the day.
Short Term (days, hours)	Egrets (cattle birds) flying away from the water sources	Egrets, also known as cattle birds are water birds. When heavy rain is likely, these birds leave the waterside and fly to upland areas.
Short Term (days, hours)	The cry of the *Vulawe* bird	The *Vulawe* bird is known to herald the coming of a rainfall event by loudly sounding its cry.

Overview of some traditional warning systems (Hajat et al., s.d.)

6. Projects based on the evolution of local building cultures

6.1. Malawi floods and rains recovery program: Learning from tradition

Project by: CRS & CADECOM

Sources: CRS & CADECOM (2015), CRS (2015; 2018)

Project description

Project location: Zomba, Phalombe and Machinga districts

Disaster: Floods

Disaster date: January 2015

Project duration: 8 months

Target population: 1,090 families

Material cost per family (in USD): $552 (inclusive of training and dissemination)

Donor: CRS private funds

Partner: Cadecom (Caritas Malawi)

Project principles and scope

The programme explored and built upon existing local knowledge and practices, which enhanced the ownership and commitment of the residents and ensured that any recommendations were site-appropriate. The resources and information produced were shared with the Shelter Cluster in Malawi, so that other actors could use them. Ultimately, this approach provided a practical, inexpensive and replicable model to respond to similar flood events, in these and other parts of the country.

Shelter Recovery Strategies

When asked, people said that they intended to repair or reconstruct their homes during the dry season using the same building techniques and materials that they previously used, and were interested in what building methods could make houses more resilient.

Materials such as burnt brick, cement, and corrugated iron sheet roofing are beyond the financial means of the poorest households. To have wider impact, there was a need for assistance to be focussed on Safer Building solutions using local materials that were affordable, replicable, and achievable by the most vulnerable and at risk households.

The program provided:

- Local builder training in Safer Building to support their communities;
- A model house built in each community as an example of Safer Building;
- Information and training provided to each community;
- 1350 vulnerable households provided with tools, materials and technical guidance to build their home and construct latrines.

Shared Learning

Best building practices were identified through theory and practical workshops with local builders. Each workshop culminated in the construction of a Model House using the developed techniques. A training and information curriculum for communities and builders was produced, covering the following themes:

- Hazard and Risk awareness;
- Site Selection and house Orientation;
- Building Design;
- Materials;
- Construction;
- Protection and Maintenance of the house and environment.

The workshops allowed a progression of learning and sharing of ideas. These were tested and reinforced during the practical sessions.

Images of the construction process.
© Jamie Richardson (CRS)

Housing design and techniques

Many traditional houses had survived the floods with little or no damage, even after weeks of standing water, including those constructed using earth brick and render. This was because these houses had raised platforms that protected the core structure from erosion, and the veranda and large roof overhangs ensured that the gables and walls were protected. This design, developed over centuries, provided protection from the elements and, other than some minor repairs needed for the veranda and walls, allowed many families to return home once the flood water receded.

In this response, CRS provided technical solutions, including refinements to the traditional house design, so that the roof could continue to be supported by the veranda posts should the earth walls collapse. During the training workshops, soil selection was a key topic for making adobe bricks and for a correct brick-making processes. The reason why many buildings collapsed was due to the quality of the bricks and insufficient thickness of the walls. Therefore, the improved design increased the wall width (from 10 to 15cm) so they were more stable. It also ensured that internal walls had proper foundations and were connected to the outside walls, to further strengthen the structure.

Results

Participation of families: Families prepared latrines with temporary superstructures and cleared sites prior to receiving construction materials. Households also supplied bricks, thatch, and labour.

Construction of model homes: the CADECOM team constructed the model homes in less than 10 days. Model homes were built according to traditional designs.

Floor area (not including veranda, and kitchen): 16.5 m²

Total costs of materials: approximately $200. Materials were provided and cash-for-work grants for the 10% most vulnerable households.

Cost of tool kit (shared between 4 families): $80

Durability: building lifespan of around 15 years.

Involvement of communities: the communities were actively involved in the project. Community leaders commended the program for recognising traditional skills and knowledge as an affordable, effective means of coping with heavy rains and flood.

Training and information were provided to the communities, using the model house as an example.

The project should reduce the impact of future flooding and rains upon families and communities by reinforcing and building upon current good practice using local materials and available skills.

One of the finalised houses. © Jamie Richardson (CRS)

Image of the construction process. © Jamie Richardson (CRS)

One of the finalised houses. © Jamie Richardson (CRS)

Materials	Quantity	Unit Cost (USD)	Total Cost (USD)
Ridge Poles	6 Pcs	2.30	13.79
Rafter Poles	30 Pcs	1.84	55.17
Wall Post Poles	10 Pcs	1.15	11.49
Battens	80 Pcs	0.46	36.78
Black Plastic Paper	1 Roll	13.79	13.79
Tiewire	1 Roll	4.60	4.60
3" Nails	2 Kg	2.30	4.60
Timber for Doors	1 Pcs	13.79	13.79
Timber for Windows	2 Pcs	4.60	9.20
Earth Bricks	2,400 Pcs	0.01	16.55
Thatch	1 Pcs	20.69	20.60

Materials list. © CRS (2018)

TO FIND OUT MORE

Malawi: Constructing Homes by Adapting Traditional Building Resilient Strategy for Living with Floods
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7. Additional resources and bibliography

7.1. For further information

General

A

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7.2. Key concepts

Adaptive Capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC, 2014).

Building cultures: A building culture is the intangible dimension of a construction or a settlement produced by humans to live, work, thrive, etc., and is strongly connected with its environment. It includes assets related to each phase of the building life cycle: design, construction, use(s), maintenance, replacement, extension, adaptation, etc., which are often related to social, economic, environmental and cultural aspects, including symbolic systems.

The genesis and evolution of building cultures are closely linked to their environment and to the specific history of each territory. This is the reason why they are so diverse across the world and why several building cultures can co-exist within a single territory.

Disaster: Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC, 2014).

Exposure: The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC, 2014).

Globalised habitat: Around the world, building is increasingly influenced by "global trends" and a growing interest in the reproduction of international solutions and in industrial materials such as cement, steel and CI Sheets. These are often implemented to replace more traditional materials (such as thatch) without considering that changing one element of the construction can affect the way the structure performs as a whole, possibly compromising structural safety, thermal comfort and other important features of the building. Therefore, one of the challenges of the Local Building Cultures (LBC) approach is to take on board such tendencies and make sure that expectations are met when proposing designs for the construction of shelter projects.

Hazard: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. The term hazard usually refers to climate-related physical events or trends or their physical impacts (IPCC, 2014).

Precarious habitat: The term "precarious habitat" covers different realities depending on the specificities of the places and the factors that generate it: economic difficulties, climate change, disasters or armed conflicts. It characterises houses or shelters built by low-income families or by those who, without a

land property title, prefer to limit their investment by choosing light structures that are easy to dismantle or repair. These constructions are primarily found within peripheral urban areas where illegality often correlates with a negative perception and with high-risk, hazardous and disaster-prone areas and precarious living conditions that expose inhabitants to frequent destruction of their homes. This inherently leads to constantly rebuilding, strengthening and fixing housing structures, which may reinforce people's knowledge on what works and what does not, but also drain their income.

Despite these challenges, their connection to cities and the opportunities they offer (educational, income, recreational, etc.) result in a strong attachment to these habitats. That leads to creative design solutions, including elements of comfort, income generating uses or external spaces of socialisation that do not exist in more formal habitats.

In post-disaster or conflict situations, some shelters are intended to be temporary structures made of short-lasting materials with designs that meet basic needs. But they often become permanent structures for families who lack the possibility to repair or improve them as their shape does not allow it or the materials and skills required are not available.

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014).

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability or likelihood of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. IThe term risk is often used to refer to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social and cultural assets, services (including environmental services) and infrastructure (IPCC, 2014).

Sensitivity: The degree to which a system or species is affected directly or indirectly by climate variability or change. (e.g. directly: a change in crop yield in response to a change in the mean, range, or variability of temperature; indirectly: damages caused by an increase in the frequency of flooding) (IPCC, 2014).

Vernacular habitat: Vernacular habitat is characterised by the use of local resources to respond to people's way of life, needs and to local climatic conditions. It is therefore closely linked to the site where it is built. It often results from reproductions, improvements and on-going adjustments or adaptations over time and may include external inputs and imported solutions, though rather parsimoniously. Such constructions are mainly handmade and outside or on the outskirts of global economic exchanges. They often rely on strong links between the inhabitants and their families and neighbours and their persistence may facilitate feelings of belonging and pride within the community.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2014).

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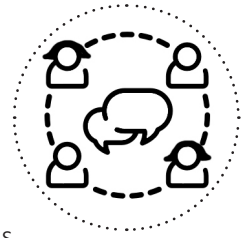
7.4. Series of detailed shelter response profiles

Country/territory	Language	First edition	Available online
Fiji	English	March 2016 (after Cyclone Winston)	https://www.sheltercluster.org/fiji-cyclone-winston-2016/documents/fiji-baseline-data-local-building-culture-coping-strategies
Ecuador (Coastal area)	Spanish	May 2016 (after April 16 earthquake in Coastal area)	https://www.sheltercluster.org/sites/default/files/docs/ecuador_costa_habitat_local_y_estrategias_de_respuesta_craterre310516_1.pdf
Haiti	French	October 2016 (after Cyclone Matthew)	https://www.sheltercluster.org/sites/default/files/docs/haiti_-_fiche_pays_-_cultures_constructives_locales_pour_la_resilience_et_le_developpement_-_20170920.pdf
Bangladesh	English	September 2018 (preparedness tool)	https://www.sheltercluster.org/bangladesh/documents/detailed-shelter-response-profile-bangladesh
Ethiopia	English	December 2018	https://www.sheltercluster.org/ethiopia/documents/ethiopia-country-profile
Democratic Republic of the Congo (South and East)	French	December 2018	https://www.sheltercluster.org/democratic-republic-congo/documents/rd-congo-cultures-constructives-locales-pour-des-habitats
Malawi	English	November 2021	To be confirmed
Tonga	English	Work in progress	Not published yet

Key issues for initial diagnosis and project implementation



PROJECT MANAGEMENT

- Identify regulatory and social requirements.
- Identify and meet the different authorities.
- Involve representatives of the community (stakeholder groups) and local professionals as much as possible in the decision-making process for the project.
- Coordinate the project with other ones to develop yours in a comprehensive and integrated approach.
- Carry out a field survey as soon as possible to identify the strengths and weaknesses of local building practices and the local market, as well as actual capacities and training needs.

SOCIOCULTURAL PRACTICES FOSTERING RESILIENCE

- Analyse local practices regarding community cooperation in the building sector and other sectors (e.g. agricultural activities).
- Identify local practices regarding risk preparedness and recovery.

SITING

- Carefully select the construction site to avoid risky areas, comply with business activity area requirements and grant access to basic services.
- Plan for an easy access to drinking water and sanitation services.
- Take into account land tenure issues.

LOCAL HABITAT ASSESSMENT

- Identify local building practices and know-how and valorise the ones fostering the inhabitants' resilience. Appreciate and adapt to local practices, including in the informal sector.
- Identify local practices that contribute to an ecological and comfortable habitat.
- Identify weaknesses so as to give focus to the technical reflection (reverse-engineering process).
- Include building maintenance and repair related issues in the reflection.
- Collect feedback from previous projects.
- Consider different scales: materials, elements, construction systems, building, neighbourhood, environment, territory.

ARCHITECTURAL DESIGN AND CONDITIONS OF USE

- Make sure that the solutions and practices you promote are financially and technically accessible for most people so as to ensure the long term impact of the project.
- Identify the composition of the household and local practices in terms of cohabitation and uses of indoor and outdoor areas.
- Question the concepts of durability, dismantling and reuse related to local customs.
- Allow for a flexibility of the building system so that inhabitants can develop appropriation processes and make it evolve all along its lifespan according to their needs and abilities.
- Carefully define the orientation and position of buildings and public/private outdoor spaces into the compound, and the landscaping of the latter.
- Ensure that the building design provides a sense of pride among beneficiaries.

CONSTRUCTION AND BUILDING LIFESPAN

- Select materials according to their availability and accessibility and check their quality. Select materials in order to facilitate their reuse or recycling.
- Carefully design and build the crucial elements related to risk reduction: the anchorage of the roof and the walls to the foundations, the structure bracing devices, the water-resistant plinth and/or the post ends protection systems, the protection of walls (plastering, grouting), the seismic bands, etc.
- Sensitise people about the importance of regular maintenance in DRR.
- Assess material sourcing and reuse options to ensure environmental sustainability.

BUILDING PROCESS

- Develop and insist on the potential pedagogical value of the project and on the importance of its replicability.
- When possible, build a prototype that will allow to make any necessary adjustments.
- Beware of climate and seasonal constraints affecting the availability of people and materials.
- Analyse the social aspects of the building processes and their impacts on the community cohesion and the efficiency of works. Ensure that traditional mutual help systems are valorised.
- Give priority to local populations and artisans in the building process to ensure a positive impact for the community.
- Pay attention to supervision, training and communication needs.

THE FIELD SURVEY

CAÏMI (2015)

ASSESSMENT CONTENTS & MAIN INFORMATION SOURCES

● main source
○ complementary source

	COMMUNITY MEMBERS	INHABITANTS / TENANTS / HOUSE AND LAND OWNERS	SELF BUILDERS / CONSTRUCTION ARTISANS	MATERIALS PRODUCERS / SUPPLIERS /CARRIERS / CONTRACTORS	TECHNICIANS / EXPERTS CONSTRUCTION SPECIALISTS	LOCAL AUTHORITIES / GOVERNMENTAL DEPARTMENTS	FORMAL & INFORMAL COMMUNITY LEADERS	GOS & NGOS / COORDINATION BODIES	VOCATIONAL / ACADEMIC / RESEARCH / TRAINING CENTRES	OBSERVATION IN THE FIELD	DOCUMENT REVIEW
SITE											
Natural environment	●									●	●
Socio-economic profile	●					●	●	○			●
Infrastructures	●					●	●	○		○	●
HABITAT											
Settlements	●					●	●			●	○
Housing/building typologies	●	●	●		○				○	●	○
Building construction	●	●	●		○	○			○	●	○
CONSTRUCTION PROCESS											
Activities & roles	●	●	●			●	●			○	○
Maintenance	●	●	●							○	
Training		○	●	●	●			○	●		
RESOURCES											
Materials	●	●	●	●	○				●	○	○
Skills & know-how	○		●	●	●			○	○		
Costs	●	●	●	●	○	○					
RISK REDUCTION											
Natural hazards & risks	●	●	●			●	●	○		○	○
Adaptation & coping strategies	●	●	●			●	●	○	○	●	
CAPACITIES											
Organizations & networks	●		○		○	●	●	○			
Cooperation systems	●	●	●	○	○	○	●	○	●		
Key persons & groups	●	●	●		●	●	●	○			

TO FIND OUT MORE

ON PROJECT MANAGEMENT AND FIELD SURVEYS:

- Assessing local building cultures, a practical guide for community-based assessment (Caïmi, 2015)

  https://hal.archives-ouvertes.fr/hal-01493386/file/16059_Caimi_Assessing_local_building.pdf

SELF-ASSESSMENT SUSTAINABILITY TOOL FOCUSED ON SHELTER AND SETTLEMENT RECONSTRUCTION IN THE AFTERMATH OF NATURAL DISASTERS:

- QSAND Tool

  http://www.qsand.org/

SUSTAINABLE HOUSING DESIGN TOOL TO ASSIST HOUSING PRACTITIONERS IN DESIGNING SUSTAINABLE HOUSING PROJECTS:

- Sherpa Tool

  https://unhabitat.org/sherpa/

ONLINE REFERENCE GUIDE WITH TOPICS (POLICY, PROGRAM AND OPERATIONAL FRAMEWORK) TO BE MANAGED IN EMERGENCY SITUATIONS:

- Care Emergency Toolkit

  https://www.careemergencytoolkit.org/

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Images

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Institutions

Government of Malawi. Department of Lands, Housing and Urban Development -> https://www.malawi.gov.mw/

Global Shelter Cluster -> https://www.sheltercluster.org/

Shelter Cluster Malawi -> https://www.sheltercluster.org/africa/malawi

CRAterre -> http://craterre.org / Email: craterre@grenoble.archi.fr

LabEx AE&CC / ENSAG / Université Grenoble-Alpes ->
http://aecc.hypotheses.org

Malawi University of Business and Applied Sciences (MUBAS). Faculty of Built Environment. Department of Architecture ->
http://www.mubas.ac.mw/

International Federation of Red Cross and Red Crescent societies ->
http://www.ifrc.org/

CENDEP (Centre for Development and Emergency Practice) - Oxford Brookes University ->
https://www.brookes.ac.uk/architecture/research/cendep/

CARE International UK -> https://www.careinternational.org.uk/

Catholic Relief Services (CRS) -> https://www.crs.org/

Catholic Development Commission in Malawi (CADECOM) ->
https://www.ecmmw.org/new/commissions/cadecom/

British Geological Survey -> https://www.bgs.ac.uk/

Overseas Development Institute -> https://odi.org/

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